UNIVERSITE DE LIMOGES

ECOLE DOCTORALE Sociétés et organisations n°526

Faculté de Droit et des Sciences Economiques

Laboratoire d'analyse et de Prospective Economiques (LAPE) EA 1088

Thèse
pour obtenir le grade de
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Présentée et soutenue publiquement par

Moustapha DAOUDA DALA

le 14 Décembre 2016

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« La faculté n’entend donner aucune approbation ou improbation aux opinions émises dans les thèses ; ces opinions doivent être considérées comme propres à leurs auteurs. »

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To my dear parents

Summary

GENERAL INTRODUCTION

The Global Financial Crisis (2008-2009) and the European sovereign Debt Crisis (starting in late 2009) have raised a lot of concerns about banks' financial health and have induced high information need from investors. Stress test exercises have become an important tool in the banking regulation both in Europe and in the United-States (U.S.) to provide information in a troubled context in the hope of restoring investors' confidence. The main objective of stress tests is to assess banks' resilience to different states of economy represented by plausible extreme scenarios defined by regulators. In Europe, the first stress test was run in 2009 but the list of banks involved was not published. The aim of this stress test was just to enhance the level of aggregate information among policy makers. Improved stress tests with the disclosure of more detailed individual results were performed in 2010 and 2011. The European test of 2010 addressed concerns related to the sovereign debt crisis and the soundness of the banking system. Conducted by the Committee of European Banking Supervisors (CEBS), this stress test studied the resilience of 91 major European banks to two negative scenarios. One represented a deterioration of the economy for two consecutive years, and the other further included a shock on sovereign debt. Seven banks failed the stress test because their stress tested capital ratio fall below the minimum requirement of 4% of Tier 1 indicating that they would not be able to support losses in case of financial crisis. Even so, multiple critical were addressed to this test because of too indulgent scenarios, confirmed by the fact that some banks passed the test and encountered difficulties in the following weeks. A new test was proposed in 2011 administered by the newly established European Banking Authority (EBA). The 2011 test was based on more pessimistic assumptions about the economy than the 2010 test. Furthermore, published data on banks were more detailed bringing more transparency on tested banks. Nevertheless, the most comprehensive stress test in Europe is the one conducted and published in 2014. This stress test is part of the Comprehensive Assessment[1] conducted by the European Central Bank (ECB) with close cooperation of the European Banking Authority (EBA) in the process of implementing the Single Supervisory Mechanism (SSM). The disclosure of the results is also more granular than it was for the previous tests. The SSM permits Europe to have a single regulator for the major Euro zone banks. This is a great advance in the European regulation, which thus tends to be more comparable both in terms of scale and efficiency of its implementation with the U.S. banking regulation. The first stress test in the US was conducted by the Federal Reserve in 2009. The Supervisory Capital Assessment Program (SCAP) was intended to respond to the market participants' concerns about the US banks' health in the aftermath of the 2008 financial

[1] Comprehensive Assessment is composed of the Asset Quality Review (AQR) and the stress tests.

crisis. The SCAP required the largest US Banks Holding Companies (BHCs) to simultaneously undergo a forward-looking exam in order to determine if they have enough capital to support lending in the event of an unexpected severe recession. In the case of capital inadequacy, banks would be bailout by public funds through the Capital Assistance Plan (CAP) announced the same day as the stress test. In 2010, the Dodd-Franck Act required the Federal Reserve to conduct an annual stress test and a Capital Comprehensive Analysis and Review (CCAR) for all US Bank Holding Companies. The CCAR, conducted in 2011 and 2012, has two steps of evaluation. First, in a quantitative assessment or stress test, the Federal Reserve evaluates each BHC's ability to maintain post-stress capital ratios above a minimum threshold of Tier 1 common capital ratio during each of the nine quarters of the planning. Second, a qualitative assessment covers all key areas of BHCs' capital planning processes and involves a large number of experts from across the Federal Reserve System. Since 2013, the Federal Reserve has to conduct every year another stress test in addition to the CCAR, the Dodd-Frank Act stress test (DFAST) based only on a quantitative approach. The main difference between the Dodd-Frank Act stress test and the CCAR quantitative assessment is the fact that the DFAST is conducted on a static balance sheet hypothesis[2] while the CCAR quantitative assessment is conducted on a dynamic balance sheet hypothesis. Supervisory stress tests disclose a lot of information about banks in order to increase banks' transparency and restore market participants' confidence.

As emphasized by Ong and Pazarbasioglu (2014), the regulators may ensure that the stress tests are effective and credible. An effective stress test brings more transparency, reassures investors about banks' financial health but also decreases the uncertainty in the financial markets. Several studies investigate if the disclosure of the stress test results brings valuable information to investors. For example, Petrella and Resti (2013) using an event study methodology, investigate the stock market reaction to the events related to the 2011 EBA stress test. They also regress the stock cumulative abnormal returns (CAR) over some variables disclosed from the stress tests. They conclude that the 2011 EBA stress test brings transparency to the market's participants. Morgan et al. (2014) investigate the information contribution of the Supervisory Capital Assessment Program (SCAP or stress test) introduced in February 2009

[2] Static balance sheet assumption supposes a zero growth of the balance sheet during the time horizon of the stress test. Assets and liabilities that mature within the time horizon of the exercise should be replaced with similar financial instruments in terms of type, credit quality at date of maturity and original maturity as at the start of the exercise. No workout of defaulted assets is assumed in the exercise. In particular, no capital measures are to be taken into account.

for U.S. bank holding companies. Using an event study, they find that the stress test announcement and the methodology date are essentially nonevent (no market reaction) but the clarification[3] and the results dates are informative and lead to stock market reaction. Our dissertation contributes to the literature in different manners. First, we bring an analytical framework of the market reaction to the stress test events by considering both stockholders and bondholders contrarily to the previous studies, which all focus only on the stockholders' reaction. Furthermore, we conduct the analysis during a crisis period. This enables to know if stockholders and bondholders are able to analyze the specific information disclosed with the stress test when there is financial distress. Second, we also bring a comparison between the stress tests conducted in Europe and in the United-States by using an original event study methodology which permits to well capture the market reaction to the stress test. The European and US banks' stress test being different in some points, we can identify which ones get more market response and restore more the investors' confidence. Finally, we investigate also the stress test information value from the point of view of credit rating agencies. Contrarily to the common agents on the financial market, credit rating agencies have ability to access to private information. This ability is facilitated by the cooperation from the issuers as well as their willingness to share even confidential information. Thus, we analyze if the stress test results disclosure impacts these agents that have the possibility to get privileged information about financial market's participants. If the stress tests bring valuable information to the credit rating agencies, the split ratings between them may decrease because of the transparency brought by the stress tests.

This dissertation is structured in three chapters each one representing a paper. **Chapter 1** deals with the stockholders and bondholders' reaction to the disclosure of the European banks stress test. **Chapter 2** investigates the information value for the stock market of the stress tests conducted in Europe and the US, while **Chapter 3** is about the impact of the disclosure of the stress test results on credit rating agencies.

[3] On the clarification date, the Federal Reserve clarifies that the results of the stress tests will not be used as a basis for nationalizing banks.

Chapter 1: Stockholders and bondholders' different reactions to information disclosure: the case of the 2011 European Bank Authority's stress test

In this chapter, we investigate how stockholders and bondholders react to the information disclosed in the financial market during crisis periods. We consider the 2011 EBA stress test as it discloses detailed information about banks and it is conducted during the European sovereign debt crisis and we use an event study methodology. We calculate stock abnormal returns by using the market model as in Campbell et al. (1997), while for the bond abnormal returns we use the mean adjusted model (Maxwell and Stephens (2003), Bessembinder et al. (2009)). We first bring an individual analysis of the stocks and bonds cumulative abnormal returns (CAR) and after we analyze the average CAR considering different sub-samples of banks. We find that stockholders' reaction is more specific to the information disclosed, while bondholders have generally macro reaction and are more sensible to the financial crisis. However, when we go further in our analysis by considering the different categories of bonds, we find that the behavior of subordinated bondholders tends to be closer to the behavior of stockholders. This specific reaction of stockholders during financial distress may make them agents more susceptible to impose market discipline when there is a financial crisis.

Chapter 2: Bank opacity and market reaction to regulatory stress tests

In this chapter, we consider the European and US banks' stress tests to investigate the information value of the stress tests using stock market prices. This chapter has two objectives. First, we consider a sample of tested and non-tested banks and analyze if the transparency brought by the stress test is only for tested banks or if this transparency impacts also the non-tested banks. Second, we investigate if the stock market reactions to the stress test announcements are different according to the degree of opacity of banks. To conduct the analysis, we use an original event study methodology, which uses the absolute value of the abnormal returns to well capture the market reaction. As events, we consider the announcement of the stress test realization and the disclosure of the results of the stress tests both for Europe and the United-States. We find that the stock market reacts significantly for the announcement and the disclosure of the stress tests' results on the whole banks (tested and non-tested) meaning that the stress test transparency has an impact not only on tested banks but also on banks that do not participated to the stress test. By separating the sample of banks in less opaque and highly opaque banks, we also find that the market reaction for less opaque banks is greater than for highly opaque banks.

Chapter 3: What is the information value of bank's stress tests? An investigation using banks' bond split ratings

Banks' activities are characterized by their inherent opacity. Bank opacity can be measured by the split ratings on banks themselves or on their bonds. In this chapter, we study if the disclosure of the results of the stress tests brings valuable information to credit rating agencies. The disclosure of the results of the stress tests is supposed to bring transparency to the market participants and then may decrease the split ratings between the rating agencies. To conduct this study, we consider all the stress tests conducted in Europe (3) and in the United-States (6) between 2009 and 2015. To calculate the split rating variable, bonds' initial ratings are collected from Bloomberg database. We consider bonds jointly rated by Moody's and Standard & Poor's and issued by banks that participated to the European and US banks' stress tests. We first bring a statistical analysis by considering different measures of split ratings and second, we regress the split rating variable over some banks' financial variables from the stress test results disclosure. We find that the disclosure of the stress test results has a significant effect on the split ratings both for European and US banks. Our analysis of the split rating on the period before and after each stress test results disclosure in Europe and in the US shows that the stress tests have mixed effect on credit rating agencies. The detailed data disclosed by the stress tests could be interpreted differently by market's participants and these different interpretations may create more disagreements. This explains why, in most of the stress tests we studied, we find an increase in the split rating disagreements between Moody's and Standard & Poor's. However, we remark that in periods of distress i.e. during the European sovereign debt crisis, because of the high information need and the greater uncertainty, the stress tests results disclosure tends to decrease the split ratings.

***

The remainder of the thesis is organized as follows. We start to present respectively the three chapters outlined above. Then, we discuss the lessons learn from our results in a concluding chapter. Finally, we provide all the references cited in the three chapters in a separate part and give a detailed table of contents at the end of the thesis.

CHAPTER 1

Stockholders and bondholders' different reactions to information disclosure: *the case of the 2011 European Bank Authority's stress test*

1.1. Introduction

Banking is one of the most important sectors of the economy. For this reason, banks are submitted to a strict control by regulators. In addition to this regulatory control, they are also subject to market discipline. An effective market discipline suggests that market participants assess bank riskiness and incorporate promptly risk changes in their assessments. Thus, security prices should reflect the actual riskiness of the bank. However, during a crisis period, the process of market discipline can be disrupted. Levy-Yeyati et al. (2010) show that macroeconomic factors outweigh banks' fundamentals in explaining the behavior of depositors during the crisis in Uruguay and Argentina in 2000 and 2001. They argue that the informational content of bank-specific data declines during crises period. Hasan et al. (2013) study the depositors' discipline in the Central European countries during the 1994-2011 period. Using dynamic panel models with comprehensive data set as accounting measures, mass-media rumors, and capital injections, they find that, during the crisis period, the depositors' behavior is more influenced by negative rumors about banks' financial health than these companies' fundamentals (accounting measures). Levy-Yeyati et al (2004) find the same result by studying the depositors' behavior during the crisis in Argentina and Uruguay around the year 1998. Indeed, they argue that systemic risk deteriorates the information content of banks' fundamentals and then the discipline imposed by depositors is more related to the macroeconomics news about the banking system. Peria and Shmuckler (2001) also show that, during a banking crisis, systemic shocks affect deposits and interest rates regardless of banks' fundamentals. During a crisis period, the panic created and the increase in opacity may at least partially explain the failure of market discipline.

The recent European sovereign debt crisis has caused some disturbances on the financial market. High exposure of banks to the sovereign debt, especially to the most affected countries (Portugal, Italy, Ireland, Greece and Spain or PIIGS countries) has increased market participants' concerns about banks' financial health. Considering the period of the European debt crisis, we investigate how banks' stockholders and bondholders react to the release of information. More precisely, we study whether they are able to analyze the information during a period of financial turbulence. When the European debt crisis began, the European regulators have decided to carry out a stress test exercise with publicly disclosed results in order to restore investors' confidence. We consider the information related to the 2011 European Banking Authority (EBA)'s stress test as information provided to the financial markets during a crisis

period. Different studies have analyzed the information content and the importance of banks' stress test (Gick and Pausch, 2012; Schuermann, 2014; Morgan et al., 2014; Petrella et Resti, 2013) but do not consider the reaction of bondholders. The comparison of stockholders and bondholders reaction to different events such as merger announcements (Penas and Unal, 2004) or repurchases agreements (Maxwell and Stephens, 2003) has also been studied in the literature but not during crisis period. We thus contribute to the literature by comparing the reactions of two kinds of investors, stockholders and bondholders to different public information. Furthermore, we analyze these reactions in a crisis period in order to investigate if their behaviors are explained by the public information disclosed or by the systemic shock created by the crisis.

To conduct this study, we focus on the stress tests as they are supposed to produce information and the 2011 European stress test is during the sovereign debt crisis. We consider two kinds of stress test information to compare the reaction of stockholders and bondholders. First, the stress test pre-results announcements, which indicate the manner that the stress test is conducted, are considered as the signal generating process. These pre-results announcements provide information on how the stress test results will be disclosed and the remedial measures that will be taken for banks that failed the test. Second, the publication on the results disclosure date of quantitative data for each individual bank that participated to the stress test is considered as the signal provided to the financial market. We then analyze the reactions of stockholders and bondholders to the signal generating process and the signal by using an event study methodology. We calculate cumulative stock abnormal returns by using the market model (Campbell et al., 1997). The cumulative bond abnormal returns are obtained using the mean adjusted model which takes into account the term structure change (Bessembinder et al., 2009; Maxwell and Stephens, 2003).

We find that stockholders' behavior is more specific and more related to the signal generating process and to the signal announcements. Bondholders' reaction is more influenced by the general market movements and the macroeconomics negative news that circulated during the crisis. Thus, stockholders are more susceptible to impose market discipline during financial crisis. However, when we extend the analysis by considering the different categories of bonds i.e. secured, unsecured and subordinated bonds, we find that subordinated bond holders' behavior is closer to the one of stockholders. Therefore, they are also likely to exert an effective market discipline during a crisis period.

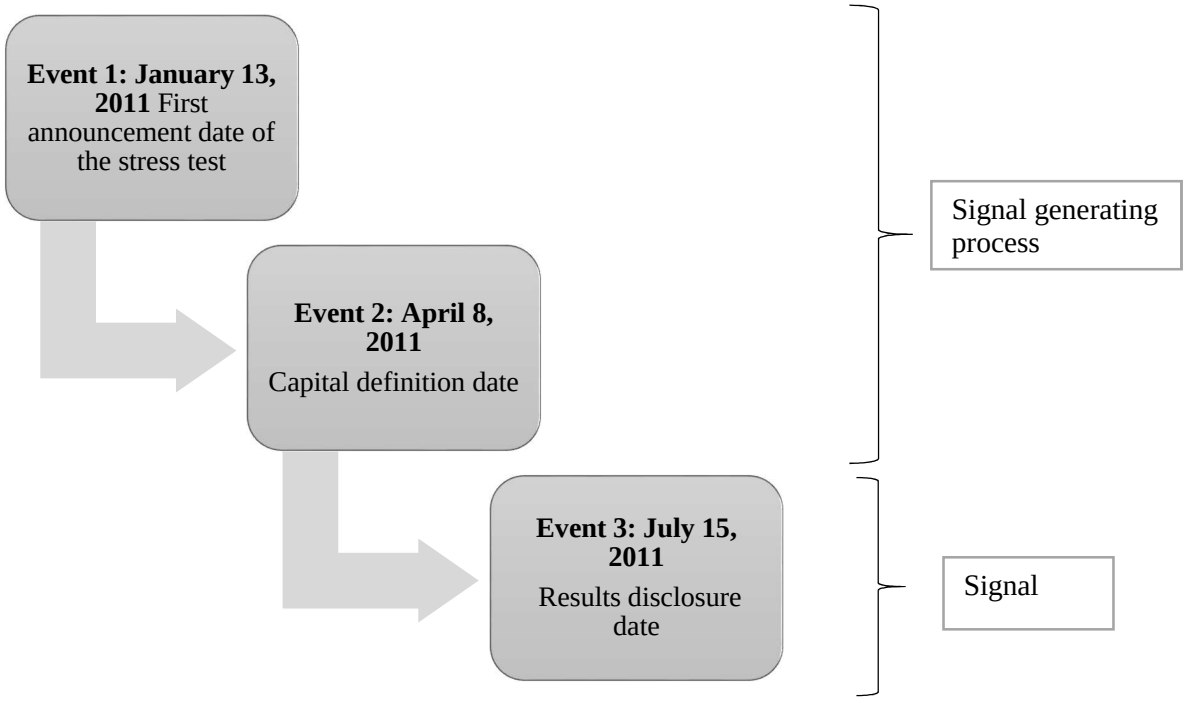
The paper is organized as follows: Section 2 presents the methodology of the event study and the sample; Section 3 presents the empirical results; Section 4 brings some robustness checks and Section 5 concludes the paper.

1.2. Methodology and sample

1.2.1. **The events:** the signal generating process and the signal

We focus on the 2011 European stress test to analyze the reaction of stockholders and bondholders to information gathering in crisis time. Two kinds of information are considered: the signal generating process and the signal due to the disclosure of the results. Figure 1 shows the time line of the three retained events.

Figure 1: Timeline of the key events of the 2011 European Banking Authority's stress test.



The signal generating process consists in the EBA key announcements about the stress test before the stress test results disclosure. Thus, it does not bring specific information about banks. It only reveals the occurrence of future measures or actions. However, as it takes place in a crisis context, it allows a better understanding of the reaction of the market in such period. More precisely, it reveals whether market agents can rationally analyze these announcements or panic

in a crisis context. We focus on two key dates before the disclosure of the results of the stress test. First, we consider the announcement of the stress test that is on *January13, 2011.* This announcement can induce a reaction of market participants because of the expected transparency effect. The future release of the stress test results should bring information on banks' financial health and on their risk exposure in different countries. If stockholders and bondholders think that the stress test realization will reduce bank opacity, we can expect a positive reaction because investors anticipate benefits associated with lower opacity[4] (lower asymmetric information). Nevertheless, investors could perceive the necessity of the stress test implementation as a negative sign indicating a worrisome situation of the overall banking sector and then stockholders and bondholders could react negatively to this announcement. Second, we retain *April 08, 2011* when the EBA declares that in order to ensure full transparency, the stress test will include full disclosure of all capital elements included in CT1[5] (Core Tier 1) capital ratio and their evolution since December 2010, under both the baseline and the adverse scenarios of the stress test[6]. Disclosing detailed capital elements ensures the transparency of the stress test exercise and allows market participants to make additional calculations if deemed necessary. The 5% Core Tier 1 ratio is retained as benchmark and each stress tested bank must meet this ratio to pass the exercise, if not the supervisory authority has to take appropriate remedial measures (i.e.: impose capital increases) and execute them in due time. On this date, the EBA releases also the list of 90 banks included in the stress test exercise. These banks represent more than 65% of banking assets in the EU and more than half of their national banking sector assets. Besides, the EBA offers banks the opportunity to increase their capital during the stress test process and thus before the release of the results This possibility of capital increase can be interpreted by stockholders as an incentive given to banks to continue their activity more comfortably and thus could consolidate their share price or generate greater future dividends. Hence, a positive reaction can be expected. However, a negative reaction of stockholders may also be expected due to the dilution effect caused by the possible capital

[4]Theory suggests that more disclosure by reducing asymmetric information can reduce firm's cost of capital (Diamond and Verrecchia, 1991).

[5]These capital elements are described in a special document published by the European Banks Authority and are available following this link: https://www.eba.europa.eu/documents/10180/15932/Capital-definition-criteria_1.pdf

[6]The baseline scenario is mainly based on the European Commission forecast realized toward the end of 2010. The adverse scenario covers 2011 and 2012 and make assumptions in terms of deviation of macroeconomic variables from a given baseline scenario.

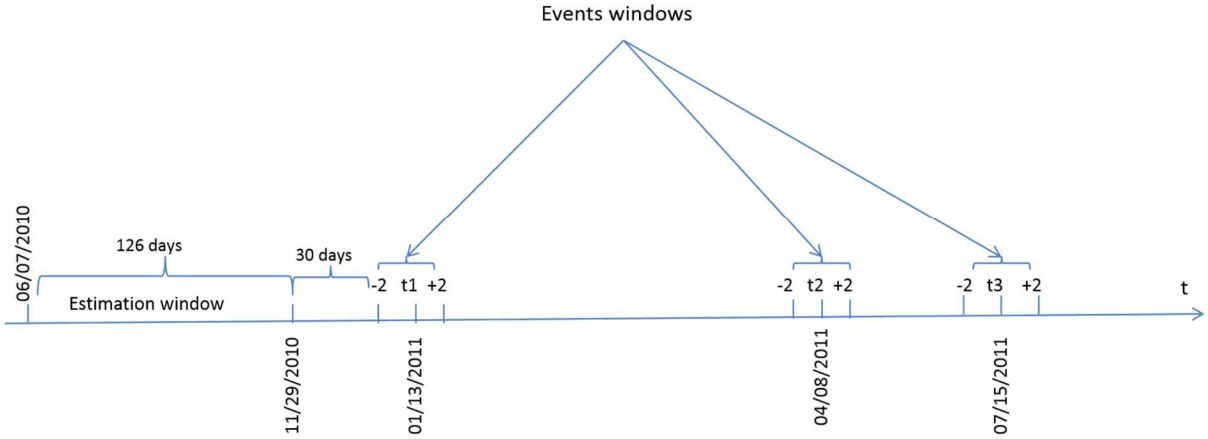
increase. For bondholders, this announcement is good news because the potential increase in capital decreases the bankruptcy probability of banks.

The signal represents the disclosure of individual banks' quantitative data from the stress test results. On the date of disclosure, *July 15, 2011*, the stress test exercise reveals that 20 banks failed the test with an aggregate capital shortfall of EUR 27 billon. However, the approach adopted by the EBA gives a possibility to banks to strengthen their capital position until the end of April 2011 to ensure they pass the test (mitigating measures). When this is taken into account, only 8 banks failed the test with an aggregate capital shortfall of EUR 2.5 billon. Furthermore, 16 banks passed the test with a core tier 1 ratio below 6%. If the stress test does not bring new information to the market, no reaction should be observed. If it reveals information to stockholders or bondholders, we should observe a significant reaction, positive or negative depending on the individual information revealed on the bank. Thus, stockholders and bondholders should react in the same way to the specific information revealed. However, if the sign of the reaction should be similar, we can expect a more important reaction for bondholders as stockholders are supposed to be better informed about the situation of the bank and to monitor it more closely.

1.2.2. Methodology of the event study

We use a 5-day event window including 2 days before the event and 2 days thereafter (-2, +2). This interval captures not only the risk of a news leak before the announcement of the event but also the possibility that the investors' reaction is not immediate but delayed a bit, until the news are properly absorbed. Taking a larger event window would increase the risk of incorporating both the specific reaction of investors to the event and reactions to other events that occurred in the event window. For each event date, we calculate cumulative abnormal returns (CAR) on the whole event window, CAR(-2,2). We also provide CAR(-2,-1) in the eventuality of information leakage and CAR(0,2) in the case where the reaction lasts several days after the event date. We consider a 126-day (six-month) estimation period (Bessembinder et al., 2009) which is from 06/07/2010 to 11/29/2010. This estimation period is the same for all the studied events and is prior to all of them. This ensures that a studied event is not included in the estimation period considered for another event. There is a 30-day interval between the end of the estimation period and the beginning of the first event window to avoid the contamination of the estimation period by the first event window (Maxwell and Stephens, 2003). Figure 2 gives an overview of the different windows of the study.

Figure 2: Description of the event windows



t= t1, t2, t3 are the event dates.

Event studies involve calculation and testing of securities' abnormal returns. The abnormal return for a given security or portfolio is the return generated over a period of time that is different from the expected rate of return. The majority of event studies that consider stock returns calculate the expected returns by using the market model (Campbell et al., 1997).

To compute the stock abnormal returns, we first estimate the market model on the estimation period by regressing the daily stock return for each individual bank, $R_{i,t}$ on the market return $R_{m,t}$ proxied by the market index of the corresponding country[7]. We collect these market indexes from Bloomberg Database. Using a market model based on a global European index would not take into account country specific effects.

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t} \quad (1)$$

Then, we estimate separately for each bank the parameters α_i and β_i using daily data from 06/07/2010 to 11/29/2010. The abnormal returns (AR) implied by the market model correspond to the residuals of equation (1):

$$AR_{i,t} = \hat{\varepsilon}_{i,t} = R_{i,t} - (\hat{\alpha}_i + \hat{\beta}_i R_{m,t}) \quad (2)$$

[7]These index are DAX (Germany), BEL20 (Belgium), KAX (Denmark), IBEX (Spain), HEX (Finland), SBF120 (France), ASE (Greece), BUX (Hungary), ISEQ (Ireland), ITLMS (Italy), OBX (Norway), ATX (Austria), PSI20 (Portugal), SAX (Sweden), ASX (Great Britain).

The main method to calculate bond abnormal returns is the Mean Adjusted Model, which takes into account the term structure change. The method is introduced by Handjinicolaou et al. (1984) and recently used by Maxwell and Stephens (2003) and Bessembinder et al. (2009). Following Maxwell and Stephens (2003) and Bessembinder et al. (2009), we first calculate bond daily returns as follows:

$$BR_{i,t} = \ln(P_{i,t} / P_{i,t-1}) \quad (3)$$

$BR_{i,t}$ is the rate of return of bond (i), between closing of trade at day (t-1) and closing at day (t),

$P_{i,t}$ is clean mid-price of bond (i), at date (t)

$P_{i,t-1}$ is clean mid-price of bond (i), at date (t-1)

To calculate bond abnormal return, we first compute the bond's premium day holding period return (PBR) for bond (i) during day t as the bond's daily return (BR) minus the return on a matched Treasury security (TR). In order to take into account both time to maturity and coupon, banks' bonds are matched with the Treasury securities with the closest duration.

$$PBR_i = BR_i - TR_i \quad (4)$$

Then, we compute the mean expected excess return (EBR) for bond (i) which corresponds to the average of PBR during the estimation period from 06/07/2010 to 11/29/2010:

$$EBR_i = \left(\sum_{t=t1-158}^{t1-33} PBR_{i,t} \right) \frac{1}{126} \quad (5)$$

Finally, the abnormal bond return (ABR) for bond (i) is calculated as:

$$ABR_i = PBR_i - EBR_i . \quad (6)$$

In our sample, the majority of banks have multiple bonds outstanding. In the previous literature, different approaches are followed to deal with this issue. Some authors consider each bond as a separate observation (Hand et al., 1992; Warga et al., 1993). In this way, the event study is

done at the bond level not at the individual firm level. Thus, each bond is considered as a separate observation. This approach is called *Bond Level Approach*. However, given the likely high correlation between returns of bonds issued by a same firm, this approach would inflate the t-statistics and more heavily weight firms with multiple issues in the sample. Another approach (denoted *Firm Level Approach*) treats each bank as a portfolio. In this approach, the abnormal return is calculated for each bond and the bank's abnormal bond return is the value-weighted average of the abnormal returns of the different bond issues. The weighted-average abnormal bond return for bank k at day t is calculated as follow:

$$ABR_k = \sum_{i=1}^{J} ABR_i w_i \ , \tag{7}$$

where J is the number of bonds outstanding for bank k, and w_i is the weight applied for bond (i) calculated as the amount of the bond (i) issuance divided by the total amount of all bond issuances of the bank.

In this paper, the analysis is mainly based on the *Firm Level Approach*[8].

After calculating the abnormal returns, we sum them over the relevant window around the event date in order to compute the cumulative abnormal returns (CAR). If we consider T+1 to T+k as an event window, the $CAR_{i\,T+1,T+k}$ is calculated for stock prices as follow:

$$CAR_{iT+1,T+k} = \sum_{j=1}^{k} AR_{iT+j} \tag{8}$$

and for bond prices as follows

$$CAR_{iT+1,T+k} = \sum_{j=1}^{k} ABR_{iT+j} \tag{9}$$

The test of significance for individual bank CAR is given by the statistic below:

[8]We also considered the Bond Level Approach as a robustness check (cf section 4.). Conclusions are similar.

$$t = \frac{CAR_{iT+1,T+k}}{\sqrt{Var(CAR_{iT+1,T+k})}} \quad (10)$$

where $Var\ (CAR_{iT+1,T+k}) = k * \sigma_{\varepsilon_i}^2$ is the variance of $CAR_{iT+1,T+k}$ (Campbell et al., 1997).

For further analysis, we also present the results obtained for the average CAR[9] computed on different subsamples of banks.

1.2.3. Sample description

We consider a sample of European banks for which both stock and bond prices are available from Bloomberg database. To collect bond data, some criteria are retained. We follow Elton and Gruber (2001) by eliminating all bonds with a special characteristic like puttable or callable bonds and consider only bullet bonds. These latter cannot be redeemed early by an issuer and the face value is paid at once on the maturity date. In this way, we ensure that the bonds are traded on the entire period. The bond issue date must be before 06/07/2010 (the first day of the estimation period) and the maturity date after 07/19/2011 (the last day of the last event window). We keep only bonds whose issue currency is euro in order to capture the specific impact of the Eurozone sovereign debt crisis. With these criteria, we obtain 7237 bonds issued by 107 banks. Nevertheless, after eliminating all bonds for which price is not available or that are not frequently traded and bonds for which the duration is not available in Bloomberg, we obtain 2331 bonds issued by 71 banks. After eliminating unlisted banks and subsidiaries, our final sample contains 1016 bonds issued by 44 banks listed on the stock market. In this sample, 34 banks (897 bonds) participated to the EBA's stress test while 10 banks (119 bonds) did not[10]. All information about bonds (duration, amount issued, issuer, maturity), equity prices and market indexes are obtained from Bloomberg.

Because we consider only bonds issued in euro currency, we take the German treasury yield as benchmark to compute bonds' premium day holding period returns (PBR).We have so collected

[9] We present the standardized average CAR in the different tables. We test the significance with the adjusted-Patell statistic (Kolari and Pynnönen, 2010) to handle clustering problems. We also present a non-parametric test, generalized rank test (G-rank test) proposed by Kolari and Pynnönen (2011).

[10]The names of the banks (tested and non-tested) included in our sample are presented in Table A1 in appendix.

from Bloomberg the German Treasury bonds daily yield and their historical duration for different maturities (3 months, 6 months, 1 year, 2 years, 3 years, 4 years, 5 years, 6 years, 7 years, 8 years, 9 years, 10 years, 15 years, 20 years and 30 years).

1.3. Empirical results

We first analyze how banks' stockholders and bondholders behave in reaction to the signal generating process and to the signal considering the individual CAR of banks. Then, we bring an overall analysis on different groups of banks.

1.3.1. Stockholders and bondholders reactions to the 2011 EU stress test: Individual analysis

The tested and non-tested banks' individual CAR are presented in Table 1 for stockholders and in Table 2 for bondholders[11]. When we consider stockholders, 35% of tested banks' have significant and positive CAR (at the 5 % level of significance) on at least one window for the first announcement of the stress test. These banks are mainly from Italy, Portugal and Spain that are among the most affected countries during the European sovereign debt crisis with Ireland and Greece (named PIIGS countries). In the sample of non-tested banks, there are only two banks that have significant stock prices reactions to the first announcement at the 5% level. Thus, stockholders value positively the realization of the stress test for tested banks that are the most exposed to sovereign risk i.e. banks from PIIGS countries. Considering bondholders, they respond significantly and negatively to the first announcement of the stress test for the majority of tested banks (62% of the sample) except for the two Irish banks (Allied Irish Banks and Bank of Ireland) for which the reaction is positive. This positive reaction of the Irish banks' bondholders may be explained by the nationalization of Allied Irish Bank announced at the end of December 2010. 50% of the non-tested banks' bondholders also react negatively to the announcement of the stress test realization. This shows that at the announcement of the stress test, bondholders have a global concern; they react for both tested

[11]As the previous EBA's stress test in 2010 was realized almost on the same set of banks as the one of 2011, and as all the tested banks of our sample were involved in the 2010 test, we suppose that market participants are able to distinguish the tested from non-tested banks since the first announcement date of the 2011 stress test.

and non-tested banks. This could be due to the doubts on the extent of the banking system's exposure to the sovereign risk. Thus, their negative reaction, which is not specific to tested banks, shows that they do not rationally react to the signal generating process but rather panic in this crisis time.

At the 2nd announcement that we consider in the signal generating process, capital definition announcement, stockholders response positively in most cases. However, there are also negative reactions for Irish banks and for the German bank, Commerzbank. For the Irish banks, the negative reaction may be due to their large deficit of capital announced in March 2011 in the press. The negative reaction could be also due to the dilution effect because the two Irish banks mentioned above raised a high level of capital motivated by the mitigating measures authorized by the EBA[12]. There are also significantly positive reactions of stockholders for 30% of non-tested banks. These reactions are for Italian banks. This might be explained by the fact that all Italian tested banks increased their capital as part of the mitigating measures authorized by the EBA (See Appendix 1). This can generate a new benchmark for capital that affects the behavior of non-tested banks. There are fewer reactions of tested banks' bondholders; only 15% at the 5% level of significance and they are positive except for Banco BPI SA (Portugal). There is no significant bonds' CAR for non-tested banks.

Therefore, during the signal generating process, stockholders react to the different announcements. By responding positively to the announcement of the realization of a stress test, they value the future benefits in terms of transparency for tested banks. They also positively react to the capital definition announcement and extend their reaction to banks in countries where tested banks have increased their capital. Bondholders' behavior is totally different as they react negatively to the announcement of the realization of a stress test and this reaction is not specific to tested banks. Thus, they seem more influenced by the general context and this announcement exacerbates their negative perception of the overall banking system. However, they are virtually and quite logically indifferent to the capital definition announcement that does not change their perception of bond default risk.

[12] Table A1 in appendix presents banks' CT1 before and after mitigating measures.

When we consider the response to the disclosure of the stress test results, all the 1% and 5% level significant abnormal stock returns for tested banks (15% of the sample) are negative except for one Swedish bank. Tested banks' bondholders react negatively on 27% of the sample of banks. The reaction is only for banks from Italy, Portugal and the Austrian bank Raiffeisen Bank International. This negative reaction may be partially due to the specific information about the sovereign debt exposure revealed during the disclosure of the stress test results.

Thus, when specific information is disclosed, both stockholders and bondholders learn information for some banks. However, we find more reactions for bondholders implying that stockholders had already correctly assessed the situation of most banks, even banks in PIIGS countries, before the release of the stress test results.

In order to have a more comprehensive view of the results, we then conduct further analyses by groups of banks.

Table 1: Cumulative stock abnormal returns for individual banks

Country	Stress test events	January 13, 2011: first announcement			April 04, 2011: capital definition			July 15, 2011: results disclosure		
		CAR(-2,2)	CAR(-2,-1)	CAR(0,2)	CAR(-2,2)	CAR(-2,-1)	CAR(0,2)	CAR(-2,2)	CAR(-2,-1)	CAR(0,2)
Nb. Of banks: 34		**Tested banks**								
AUSTRIA	ERSTE BANK GROUP (EBG)	0.044*	0.002	0.041**	0.026	0.018	0.008	0.008	-0.005	0.014
	RAIFFEISEN BANK INTERNATIONAL	0.013	-0.002	0.016	0.026	0.014	0.013	0.036	-0.002	0.038
BELGIUM	KBC BANK	0.097***	0.055***	0.042	0.031	0.017	0.014	0.012	-0.006	0.018
BRITAIN	HSBC HOLDINGS plc	0.041**	0.046***	-0.005	0.022	0.032***	-0.010	-0.005	-0.006	0.001
	LLOYDS BANKING GROUP plc	0.035	0.014	0.021	0.026	0.039	-0.012	0.006	0.050*	-0.043
DENMARK	DANSKE BANK	-0.019	-0.023	0.004	0.050	0.013	0.037	0.032	0.021	0.012
	JYSKE BANK	-0.001	-0.003	0.001	0.070**	0.031	0.039	-0.034	-0.015	-0.020
FINLAND	POHJOLA BANK-A	0.009	0.006	0.003	0.047*	0.041**	0.006	-0.002	-0.014	0.011
FRANCE	BNP PARIBAS	0.039	0.007	0.032	0.046*	0.042***	0.005	-0.013	-0.011	-0.002
	CREDIT AGRICOLE	0.034	0.022	0.012	0.038	0.026	0.012	-0.023	-0.010	-0.014
	SOCIETE GENERALE	0.065*	0.037	0.028	0.053	0.043*	0.011	-0.023	-0.009	-0.013
GERMANY	COMMERZBANK AG	-0.001	0.019	-0.020	-0.107***	-0.025	-0.082***	-0.134***	-0.055***	-0.079***
	DEUTSCHE BANK AG	0.040	0.010	0.031	0.022	0.016	0.006	-0.036	-0.016	-0.020
GREECE	NATIONAL BANK OF GREECE	0.034	0.026	0.008	-0.005	0.016	-0.021	0.014	0.008	0.005
HUNGARY	OTP BANK NYRT.	0.011	0.000	0.011	0.023	0.001	0.022	-0.020	-0.014	-0.006
IRELAND	ALLIED IRISH BANKS PLC	-0.024	0.031	-0.056	-0.348***	-0.099	-0.249***	0.020	-0.035	0.055
	BANK OF IRELAND	0.060	0.096	-0.036	-0.196*	-0.068	-0.128	0.050	-0.012	0.061
ITALY	BANCA MONTE DEI PASCHI DI SIENA S.p.A	0.028	0.012	0.016	0.099***	0.039**	0.060***	-0.065**	-0.026	-0.038*
	BANCO POPOLARE - S.C.	-0.044	0.041**	-0.085***	0.034	0.012	0.022	0.021	-0.000	0.021
	INTESA SANPAOLO S.p.A	0.073***	0.046***	0.026	0.060**	0.059***	0.001	0.006	0.010	-0.004
	UNIONE DI BANCHE ITALIANE SCPA	0.034	0.037***	-0.003	0.047**	0.032**	0.015	-0.070***	-0.051***	-0.019
	UNICREDIT S.p.A	0.065***	0.049***	0.016	0.026	0.027*	-0.002	-0.005	0.004	-0.009
PORTUGAL	BANCO COMERCIAL PORTUGUÊS, SA	0.037	0.033**	0.004	0.042*	0.061***	-0.020	-0.059**	-0.012	-0.047***
	BANCO BPI SA	0.023	0.018	0.004	0.085***	0.068***	0.018	0.034	0.006	0.028*
	BANCO ESPIRITO SANTO	-0.007	-0.003	-0.004	0.007	-0.001	0.008	-0.006	0.001	-0.007
SPAIN	BBVA	0.057***	0.025**	0.032***	0.012	0.014	-0.002	0.004	0.008	-0.005
	BANKINTER, S.A.	0.060*	0.040*	0.020	0.076**	0.042**	0.034	-0.036	-0.033	-0.003
	BANCO POPULAR ESPAÑOL, S.A.	0.041	-0.008	0.050**	0.033	0.018	0.015	-0.020	0.001	-0.021
	BANCO DE SABADELL, S.A.	0.071***	0.023	0.048***	0.019	0.007	0.012	-0.014	-0.028*	0.014
	BANCO SANTANDER S.A.	0.009	0.013	-0.004	0.025*	0.018*	0.007	0.013	0.003	0.011
SWEDEN	SWEDBANK AB (publ)	0.036	0.001	0.035*	0.076***	0.032**	0.045**	0.033	0.019	0.014
	NORDEA BANK AB (publ)	0.046**	0.011	0.035**	0.052***	0.027**	0.025	0.031	-0.018	0.049***
	SVENSKA HAN-A	-0.014	-0.005	-0.008	0.047**	0.015	0.032**	0.015	-0.006	0.021
	SKANDINAVISKA ENSKILDA BANKEN AB	0.035	0.010	0.025	0.041*	0.013	0.028	-0.018	-0.025*	0.007
Nb. Of banks: 10		**Non-tested banks**								
AUSTRIA	OBERBANK AG	-0.000	0.001	-0.001	-0.002	-0.001	-0.002	-0.001	-0.001	0.000
BRITAIN	STANDARD CHARTER	-0.017	-0.002	-0.015	-0.004	0.009	-0.013	0.000	0.008	-0.008
FRANCE	CIC	0.016	0.005	0.011	0.002	0.002	0.000	0.007	0.040***	-0.034*
ITALY	BANCO DESIO	-0.043	-0.005	-0.038*	0.008	0.018	-0.010	-0.001	0.001	-0.003
	BANCA CARIGE	0.029	0.008	0.021	0.049**	0.026*	0.024	-0.002	-0.007	0.005
	MEDIOBANCA	0.012	0.013	-0.000	0.069***	0.041***	0.028*	-0.019	-0.019	-0.001
	BANCA POP MILANO	0.070**	0.045**	0.025	0.068**	0.024	0.044*	-0.017	-0.037**	0.020
NORWAY	SPAREBANKEN VEST	0.013	0.017	-0.004	-0.008	-0.005	-0.003	-0.026	-0.017	-0.009
SPAIN	CAIXABANK SA	-0.032*	-0.032***	-0.000	0.005	0.002	0.002	-0.036**	-0.002	-0.034***
SWITHERLAND	UBS	0.046	0.026	0.020	0.024	0.036*	-0.012	-0.030	0.005	-0.034

*Note: this table reports the stock's cumulative abnormal returns (CAR) over the events windows (-2,2), (-2,-1) and (0,2) for each individual bank. ***,**,* indicate respectively significant at 1%, 5% and 10%.*

Table 2: Total bonds' cumulative abnormal returns for individual banks

Country	Stress test events	January 13, 2011: first announcement			April 04, 2011: capital definition			July 15, 2011: results disclosure		
		CAR(-2,2)	CAR(-2,-1)	CAR(0,2)	CAR(-2,2)	CAR(-2,-1)	CAR(0,2)	CAR(-2,2)	CAR(-2,-1)	CAR(0,2)
Nb. Of banks: 34		**Tested banks**								
AUSTRIA	ERSTE BANK GROUP (EBG)	-0.005***	-0.003***	-0.002	-0.001	-0.001	-0.001	0.001	-0.000	0.001
	RAIFFEISEN BANK INTERNATIONAL	-0.007***	-0.003**	-0.004**	-0.002	-0.002	-0.000	-0.006***	-0.002	-0.004**
BELGIUM	KBC BANK	-0.009**	-0.000	-0.009***	0.009**	-0.004	0.014***	0.001	0.000	0.001
BRITAIN	HSBC HOLDINGS plc	0.004	0.002	0.002	0.003	0.002	0.000	0.004	0.003	0.001
	LLOYDS BANKING GROUP plc	-0.003	-0.003	0.000	0.003	0.001	0.001	0.000	0.002	-0.002
DENMARK	DANSKE BANK	-0.005*	-0.003**	-0.002	-0.000	-0.000	-0.000	0.001	-0.000	0.001
	JYSKE BANK	-0.000	0.000	-0.000	-0.001	-0.001	0.000	-0.000	-0.000	-0.000
FINLAND	POHJOLA BANK-A	-0.009***	-0.005**	-0.004	-0.001	-0.000	-0.001	0.001	0.001	0.000
FRANCE	BNP PARIBAS	-0.004**	-0.003**	-0.001	0.000	0.000	0.000	-0.000	-0.000	-0.000
	CREDIT AGRICOLE	-0.005	-0.006**	0.001	0.001	0.001	0.000	-0.003	-0.002	-0.001
	SOCIETE GENERALE	-0.007**	-0.005**	-0.002	-0.004	0.000	-0.004*	-0.000	-0.000	-0.000
GERMANY	COMMERZBANK AG	-0.002	-0.002**	-0.000	0.001	0.001	0.000	-0.001	-0.001	-0.001
	DEUTSCHE BANK AG	-0.003	-0.003*	-0.000	-0.001	-0.000	-0.000	-0.000	-0.001	0.000
GREECE	NATIONAL BANK OF GREECE	0.000	0.001	-0.001	-0.001	-0.004	0.003	-0.016	-0.016	-0.000
HUNGARY	OTP BANK NYRT.	0.001	0.002	-0.000	0.004	0.002	0.002	0.005	0.002	0.003
IRELAND	ALLIED IRISH BANKS PLC	0.027*	0.003	0.023**	0.020	0.011	0.009	-0.014	-0.007	-0.007
	BANK OF IRELAND	0.048**	0.026**	0.022	0.024	0.019	0.005	-0.011	-0.008	-0.003
ITALY	BANCA MONTE DEI PASCHI DI SIENA S.p.A	-0.004*	-0.003**	-0.001	0.005**	0.003**	0.002	-0.006**	-0.001	-0.005***
	BANCO POPOLARE - S.C.	-0.005*	-0.004**	-0.001	0.003	0.002	0.001	-0.007***	-0.003**	-0.003
	INTESA SANPAOLO S.p.A	-0.006**	-0.002	-0.004	0.004	0.003	0.001	-0.008***	-0.004**	-0.004*
	UNIONE DI BANCHE ITALIANE SCPA	-0.003	-0.001	-0.002	0.004	-0.002	0.005**	-0.008***	-0.004**	-0.004*
	UNICREDIT S.p.A	-0.006***	-0.004***	-0.002	0.003	0.002	0.001	-0.005**	-0.001	-0.004**
PORTUGAL	BANCO COMERCIAL PORTUGUÊS, SA	-0.000	-0.004	0.004	0.011*	0.004	0.007	-0.023***	-0.008**	-0.015***
	BANCO BPI SA	-0.015***	-0.014***	-0.001	-0.010**	-0.007**	-0.003	-0.010**	0.001	-0.011***
	BANCO ESPIRITO SANTO	-0.040	-0.010	-0.030	0.052**	0.025	0.026	-0.106***	0.000	-0.106***
SPAIN	BBVA	-0.013***	-0.006***	-0.006**	0.002	0.002	-0.000	-0.003	0.000	-0.003
	BANKINTER, S.A.	-0.003	-0.002	-0.001	0.002	0.001	0.001	-0.002	0.000	-0.002
	BANCO POPULAR ESPAÑOL, S.A.	-0.001	-0.003	0.001	-0.003	-0.003	0.000	-0.000	0.000	-0.000
	BANCO DE SABADELL, S.A.	-0.013***	-0.004	-0.009***	0.002	-0.000	0.002	0.000	0.001	-0.001
	BANCO SANTANDER S.A.	-0.008**	-0.008***	-0.001	0.002	0.001	0.000	-0.001	-0.000	-0.001
SWEDEN	SWEDBANK AB (publ)	-0.007***	-0.003**	-0.004*	0.000	0.000	-0.000	0.001	0.000	0.001
	NORDEA BANK AB (publ)	-0.006*	-0.004**	-0.002	0.000	0.000	-0.000	0.000	0.000	0.000
	SVENSKA HAN-A	-0.008**	-0.005**	-0.003	-0.001	-0.000	-0.000	0.000	-0.000	0.001
	SKANDINAVISKA ENSKILDA BANKEN AB	-0.006**	-0.003*	-0.003	-0.000	0.000	-0.000	0.001	0.000	0.000
Nb. Of banks: 10		**Non-tested banks**								
AUSTRIA	OBERBANK AG	0.000	0.000	0.000	0.000	-0.000	0.000	0.000	0.000	0.000
BRITAIN	STANDARD CHARTER	-0.007**	-0.003	-0.004	-0.001	-0.000	-0.001	0.001	0.001	0.000
FRANCE	CIC	0.000	-0.003	0.003	-0.001	0.000	-0.001	0.000	-0.002	0.003
ITALY	BANCO DESIO	-0.007*	-0.000	-0.006**	-0.003	-0.002	-0.001	-0.000	-0.002	0.001
	BANCA CARIGE	-0.007**	-0.005**	-0.002	0.002	0.002	0.000	-0.003	-0.000	-0.002
	MEDIOBANCA	-0.004*	-0.002*	-0.002	-0.000	-0.000	-0.000	-0.005**	-0.002	-0.003
	BANCA POP MILANO	-0.010**	-0.006**	-0.005	0.004	0.002	0.002	-0.008*	-0.002	-0.005
NORWAY	SPAREBANKEN VEST	0.002	0.001	0.001	0.000	0.000	0.000	0.001	0.000	0.001
SPAIN	CAIXABANK SA	-0.009	-0.007	-0.003	-0.001	0.001	-0.002	0.004	0.001	0.003
SWITHERLAND	UBS	-0.005**	-0.002	-0.004*	-0.001	0.000	-0.001	0.001	0.001	-0.000

*Note: this table reports the total bonds' cumulative abnormal returns (CAR) over the events windows (-2,2), (-2,-1) and (0,2) for each individual bank. ***,**,* indicate respectively significant at 1%, 5% and 10%.*

1.3.2. Stockholders and bondholders reactions to the 2011 EU stress test: Aggregate analysis

We consider different groups of banks and investigate investors' reactions around the different announcements dates. We first oppose tested banks vs non-tested banks in order to appreciate if the stress test impact goes beyond the only banks participating and, if so, for which debt holders. Given the context of the Debt crisis, we then oppose tested banks belonging to the PIIGS countries from other tested banks, thereby trying to disentangle the weight of sovereign debt exposures from worsen macroeconomic situation in the eventual different reactions of stockholders and bondholders. Finally, as a major indication provided by the stress test is the resilience of banks to extreme events, we separate tested banks in two groups according to their level of stressed Core Tier1 ratio (under or above the median of the sample), and then evaluate how this Capital variable affects the behavior of the two types of investors in the successive stages of the stress test.

1.3.2.1. Tested banks vs Non-tested banks

Table 3 shows the results of average CAR for the group of tested and non-tested banks. First, when we consider the announcements of the signal generating process, stockholders react on average positively to the first announcement of the stress test event but only for the group of tested banks. Bondholders' reactions are negative for both the group of tested and non-tested banks and the impact of the reaction is not significantly different between these two groups of banks. As for the individual results, we remark that stockholders positively value the stress test realization and its possible benefits in terms of transparency for tested banks. However, in the case of bondholders, the reaction to the first announcement is negative and extended to the non-tested banks. Beyond the benefits of the stress test, they interpret the implementation of the stress test as revealing the extent of difficulties that the banking system, as a whole, faces because of the sovereign debt crisis.

Table 3: Stocks and bonds cumulative abnormal returns (CAR) for the banks that participated to the 2011 European Banking Authority stress test (tested banks) and those that did not (non-tested banks).

Events dates	Stock									Bond								
	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t
	Obs.: 34			**Tested banks (a)**												Obs.: 34		
Jan. 13, 2011	1.10***	0.00	2.33**	1.04***	0.00	2.15**	0.59*	0.08	1.38	-1.46**	0.03	-1.64	-1.49**	0.02	-1.58	-0.69	0.29	-0.99
Apr. 04, 2011	1.18***	0.00	2.76***	1.39***	0.00	2.68***	0.41	0.22	1.30	0.36	0.58	0.54	0.19	0.77	0.35	0.31	0.63	0.44
Jul. 15, 2011	-0.30	0.37	-0.31	-0.45	0.18	-0.92	-0.02	0.95	0.14	-0.80	0.22	-0.82	-0.39	0.54	-0.52	-0.73	0.26	-0.78
	Obs.: 10			**Non-tested banks (b)**												Obs.: 10		
Jan. 13, 2011	0.27	0.46	0.89	0.33	0.37	1.21	0.09	0.82	0.50	-1.29***	0.01	-1.57	-1.05**	0.04	-1.66*	-0.83*	0.10	-1.14
Apr. 04, 2011	0.87**	0.02	1.27	0.98***	0.01	1.82*	0.33	0.37	0.36	-0.04	0.94	-0.41	0.06	0.91	-0.00	-0.09	0.86	-0.15
Jul. 15, 2011	-0.54	0.14	-1.31	-0.20	0.59	-0.72	-0.54	0.14	-0.93	-0.32	0.53	-0.08	-0.20	0.69	-0.34	-0.25	0.62	0.00
	Mean equality test: (a) - (b)																	
Jan. 13, 2011	0.83*	0.06		0.70	0.11		0.50	0.24		-0.17	0.72		-0.44	0.33		0.14	0.72	
Apr. 04, 2011	0.31	0.57		0.41	0.40		0.07	0.87		0.39	0.23		0.14	0.68		0.40	0.20	
Jul. 15, 2011	0.24	0.57		-0.25	0.54		0.52	0.24		-0.48	0.28		-0.18	0.53		-0.48	0.28	

*Note: This table reports the standardized average stock and bond cumulative abnormal returns over the events windows (-2,2), (-2,-1) and (0,2) for the sample of tested banks and non-tested banks over three events dates using adjusted-Patell statistic. Grank t is the t-statistic of generalized rank test. January 13, 2011 is the first announcement date of the stress test; April 08, 2011 is the capital definition date; July 15, 2011 is the stress test results publication date. ***,**,* indicate respectively significant at 1%, 5% and 10%. Obs. is the number of banks in the sample. We report also the mean equality test between the CAR of the two groups.*

The announcement of the capital definition gives an average positive stockholders reaction but on the two groups of banks (tested and non-tested banks). The fact that non-tested banks stockholders react also positively can be explained by a benchmark effect. If the tested banks which fail the stress test are required to increase their capital, this could impact the behavior of non-tested banks in the sense that they have incentives to increase their capital as well. Furthermore, the positive reaction of stockholders shows that the expected transparency effect of the stress test, in particular the release of the detailed elements of CT1, outweighs the dilution effect that could result. Concerning bondholders, the announcement of the capital definition has no significant impact either on tested or non-tested banks.

When the signal is finally provided to the financial market, the average CAR are non-significant for both stockholders and bondholders. Thus, overall, the disclosure of the stress test result does not bring specific information to the market.

In order to better understand the behavior of stockholders and bondholders on an aggregate level, we then focus on tested banks and check if stockholders and bondholders make difference within these banks. In the individual analysis, we find some reactions of stockholders and bondholders on the banks belonging to PIIGS countries. The stress test has been decided during the sovereign debt crisis and this crisis has particularly hit PIIGS countries. Thus, we investigate whether bondholders and stockholders react differently for tested banks belonging to PIIGS countries or not.

1.3.2.2. PIIGS tested banks vs Non-PIIGS tested banks

In the individual analysis, we find that bondholders react more negatively for banks from Portugal, Italy or Spain. We thus separate tested banks from PIIGS and non-PIIGS countries to check if, on the aggregate level, stockholders and bondholders react differently on these two groups of banks. Table 4 shows that during the announcements of the signal generating process, the behavior of stockholders and bondholders is the same for banks belonging to PIIGS countries or not.

When the results are disclosed, stockholders' reaction is not significant for the two groups of tested banks. However, in the case of bondholders, the negative and significant reaction is only

for the banks belonging to PIIGS countries and the difference between the two groups of banks is statistically significant. Thus, the stress test brings new information to bondholders but only for banks that belong to PIIGS. Indeed, these banks are the most exposed to the sovereign debt, especially their home sovereign debt, but their detailed exposures were not disclosed before the stress test release[13].

In addition to specific information such as the sovereign debt exposure, the results to the stress test scenario are also disclosed for each bank. We can thus study whether it is valued by investors and how it affects their behavior.

[13] We performed a robustness check by separating banks with high or low exposure to the PIIGS countries (cf section 4). We obtain similar conclusions.

Table 4: Stocks and bonds cumulative abnormal returns (CAR) for the tested banks belonging to PIIGS countries and tested banks belonging to non PIIGS countries

Events dates	Stock									Bond								
	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t
	Obs.: 16			**PIIGS tested banks (a)**												Obs.: 16		
Jan. 13, 2011	1.21***	0.00	1.96*	1.47***	0.00	2.41**	0.37	0.35	0.70	-1.24**	0.05	-1.40	-1.38**	0.03	-1.49	-0.50	0.43	-0.72
Apr. 04, 2011	1.14***	0.00	1.98**	1.53***	0.00	1.95*	0.23	0.56	0.72	0.76	0.23	1.24	0.51	0.42	0.90	0.58	0.37	1.01
Jul. 15, 2011	-0.40	0.31	-0.38	-0.43	0.28	-0.44	-0.17	0.66	-0.08	-1.61***	0.01	-1.81*	-0.75	0.24	-1.03	-1.52**	0.02	-1.75*
	Obs.: 18			**Non-PIIGS tested banks (b)**												Obs.: 18		
Jan. 13, 2011	1.01***	0.01	1.72*	0.65*	0.09	1.10	0.78**	0.04	1.43	-1.65**	0.02	-1.72*	-1.58**	0.03	-1.56	-0.85	0.23	-1.14
Apr. 04, 2011	1.22***	0.00	2.32**	1.26***	0.00	2.16**	0.56	0.14	1.28	-0.00	0.99	-0.05	-0.10	0.89	-0.10	0.07	0.92	-0.03
Jul. 15, 2011	-0.20	0.59	-0.09	-0.46	0.22	-0.95	0.11	0.77	0.32	-0.08	0.91	0.01	-0.09	0.90	-0.09	-0.02	0.97	0.03
	Mean equality test: (a) - (b)																	
Jan. 13, 2011	0.21	0.61		0.82**	0.04		-0.40	0.34		0.42	0.39		0.10	0.82		0.46	0.23	
Apr. 04, 2011	-0.08	0.89		0.27	0.58		-0.33	0.47		0.58*	0.09		0.46	0.20		0.38	0.25	
Jul. 15, 2011	-0.20	0.66		0.03	0.93		-0.28	0.51		-1.16***	0.01		-0.67***	0.01		-0.96**	0.03	

*Note: This table reports the standardized average stock and bond cumulative abnormal returns over the events windows (-2,2), (-2,-1) and (0,2) for the sample of PIIGS tested banks and non-PIIGS tested banks over three events dates using adjusted-Patell statistic. Grank t is the t-statistic of generalized rank test. January 13, 2011 is the first announcement date of the stress test; April 08, 2011 is the capital definition date; July 15, 2011 is the stress test results publication date. ***,**,* indicate respectively significant at 1%, 5% and 10%. Obs. is the number of banks in the sample. We report also the mean equality test between the CAR of the two groups.*

1.3.2.3. Higher stressed Core Tier1 banks vs lower stressed Core Tier1 banks

To study whether the results of the stress test have impacted, at least in part, the behavior of stockholders and bondholders, we should compare the reactions of banks that failed the stress test with those that succeeded. However, in our sample of 34 tested banks, all banks have passed the stress test exercise as they got the minimum Core Tier 1 ratio of 5% required by the EBA. So, to investigate if the level of the stress tested capital revealed by the EBA on the results publication date has impacted the behavior of stockholders and bondholders, we separate the sample of tested banks in two groups according to their level of CT1 (before any mitigating measures) shown in the stress test results. The separation criterion is the median of the banks' sample stressed CT1 i.e. 7.69%. We thus consider banks for which the stressed CT1 is below the median value as the less capitalized banks and banks with stressed CT1 above the median as the more capitalized banks. The results are presented in Table 5. At the first announcement of the stress test and the capital definition announcement, the reactions of stockholders and bondholders do not differ significantly for the two groups of banks (the same comments apply as in the individual analysis of tested banks). By contrast, the common reaction of stockholders and bondholders to the stress test results shows that they learn information as they react significantly and negatively for the less capitalized banks. Both stockholders and bondholders value the results of the stress test exercise and they negatively react to the disclosure of these results for the weakest banks.

To summarize, during the signal generating process, stockholders distinguish tested from non-tested banks and positively value the signal generating process events. Bondholders react negatively to the stress test first announcement for all banks (tested and non-tested). Considering the disclosure of information, bondholders learn information from the stress test for banks from PIIGS countries and both bondholders and stockholders have negative reaction for the less capitalized banks. In terms of market discipline, debtholders cannot be considered as good players as stockholders in crisis time as they are more prone to systematize news, above all negative news, than rationally react according to bank specific characteristics.

Table 5: Stocks and bonds cumulative abnormal returns (CAR) for the tested banks classified by two groups according the level of their Core Tier 1 capital (CT1).

Events dates	Stock									Bond								
	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t
	Obs.: 17			**Tested banks' CT1 < median=7.69% (a)**												Obs.: 17		
Jan. 13, 2011	1.10***	0.00	2.02**	1.36***	0.00	2.50**	0.32	0.41	0.78	-1.16*	0.06	-1.46	-1.36**	0.03	-1.56	-0.41	0.51	-0.63
Apr. 04, 2011	0.86**	0.03	1.79*	1.34***	0.00	1.77*	0.03	0.94	0.54	0.63	0.31	1.00	0.47	0.45	0.80	0.44	0.48	0.84
Jul. 15, 2011	-0.80**	0.04	-1.08	-0.71*	0.07	-1.10	-0.47	0.22	-0.62	-1.52**	0.02	-1.72*	-0.77	0.22	-1.10	-1.40**	0.03	-1.59
	Obs.: 17			**Tested banks' CT1 > median=7.69% (b)**												Obs.: 17		
Jan. 13, 2011	1.11***	0.00	1.78*	0.72**	0.05	1.13	0.86**	0.02	1.48	-1.76***	0.01	-1.73*	-1.62**	0.02	-1.54	-0.97	0.17	-1.26
Apr. 04, 2011	1.50***	0.00	2.70***	1.44***	0.00	2.51**	0.78**	0.03	1.50	0.09	0.90	0.12	-0.09	0.90	-0.05	0.18	0.79	0.08
Jul. 15, 2011	0.21	0.55	0.54	-0.19	0.60	-0.46	0.43	0.23	0.80	-0.07	0.92	0.01	-0.04	0.96	-0.00	-0.06	0.93	-0.03
	Mean equality test: (a) - (b)																	
Jan. 13, 2011	-0.01	0.98		0.64	0.11		-0.54	0.20		0.60	0.22		0.26	0.57		0.56	0.14	
Apr. 04, 2011	-0.64	0.24		-0.10	0.84		-0.75*	0.09		0.54	0.11		0.56	0.11		0.25	0.45	
Jul. 15, 2011	-1.02**	0.02		-0.52	0.17		-0.90**	0.03		-1.45***	0.00		-0.68***	0.01		-1.34***	0.00	

*Note: This table reports the standardized average stock and bond cumulative abnormal returns over the events windows (-2,2), (-2,-1) and (0,2) for the sample of tested banks classified by two groups according the level of their CT1 over three events dates using adjusted-Patell statistic. Grank t is the t-statistic of generalized rank test. January 13, 2011 is the first announcement date of the stress test; April 08, 2011 is the capital definition date; July 15, 2011 is the stress test results publication date. ***,**,* indicate respectively significant at 1%, 5% and 10%. Obs. is the number of banks in the sample. We report also the mean equality test between the CAR of the two groups.*

1.3.3. Bond type influence on debt holders reactions

Our results show that, in a crisis period, bondholders' reaction seems mainly driven by macroeconomics negative news and systemic shocks created by the crisis. Therefore, we can question the existence of a market discipline exerted by these investors during crisis, in the sense that bond prices should reveal at least in part the perception of the specific risk of the bond issuer. However, this overall judgment masks the diversity of bondholders that cannot be regarded as an homogeneous group. Among the different debt holders, subordinated debt holders have gain a particular attention Indeed, they belong to the main players of market discipline (Bliss and Flannery, 2001; Flannery, 1998) and regulators have encouraged banks to issue subordinated bonds for this purpose.

We can explore this issue by investigating how different categories of bondholders behave to the stress test signal generating process and its results. We classify bonds in three distinct categories: secured bonds, unsecured bonds and subordinated bonds and thus identify three corresponding categories of debt holders. Unsecured bonds are common bonds with no specific characteristic, secured bonds are assets backed securities and subordinated bonds are junior compared to the others. The extent of the risk taken by investors is growing rationally in this classification. Subordinated bonds being the most risky bonds, the investor profile of subordinated debt holders is the one that most closely resembles that of the stockholders.

We first conduct the analysis using the individual CAR, computed for a given bank with only one of the three categories of bonds in the same time. We remind that we adopt the *Firm Level Approach.* Bonds of the same category issued by a bank are aggregated to get one serie of abnormal returns by type of bond and by bank (all the banks do not issue the three types of bond). Table 6, Table 7 and Table 8 display respectively the individual CAR for banks that issued secured bonds (15 tested banks and 4 non-tested banks), unsecured bonds (29 tested banks and 9 non-tested banks) and subordinated bonds (21 tested banks and 3 non-tested banks). At the first announcement of the stress test, most of banks show negative abnormal returns on their unsecured and secured bonds. By contrast, the subordinated bondholders react significantly negatively for only four banks, and they react significantly positively for Bank of Ireland (Ireland). At the second event, subordinated bonds' CAR and unsecured bonds' CAR are significant and positive (at the 5% level) only for respectively 12% and 9% of tested banks, and there is only one bank with significant unsecured bonds' CAR, this case negative. On the

signal date of the results publication, the reaction of unsecured bonds is mainly for Italian and Portuguese banks and there are only few significant reactions for secured and subordinated bonds. Thus, this first step actually confirms the heterogeneity of creditors' behavior depending on the nature of the bonds they hold.

In a second step, we proceed to an aggregate analysis of the different categories of bonds. Previously, we considered the *Firm level Approach* to compute bondholders' abnormal returns. But, if we split the bond sample in three different categories of bonds, the number of observations by aggregated category decreases deeply and this would prevent us to run efficient comparisons on bank sub-groups. For this reason, we adopt here the *Bond Level Approach* to compute the average cumulative abnormal returns for the different bond categories and compare the results obtained for the same three bank sub-groups as in our previous aggregate analysis on all bonds sample,

Table 6: Secured bonds' cumulative abnormal returns for individual banks

Country	Stress test events	January 13, 2011: first announcement			April 04, 2011: capital definition			July 15, 2011: results disclosure		
		CAR(-2,2)	CAR(-2,-1)	CAR(0,2)	CAR(-2,2)	CAR(-2,-1)	CAR(0,2)	CAR(-2,2)	CAR(-2,-1)	CAR(0,2)
Nb. Of banks: 15		**Tested banks**								
AUSTRIA	ERSTE BANK GROUP (EBG)	-0.009**	-0.006***	-0.003	-0.001	0.000	-0.001	0.002	-0.000	0.002
DENMARK	DANSKE BANK	-0.009*	-0.007**	-0.002	-0.001	-0.000	-0.001	0.002	-0.000	0.002
GERMANY	DEUTSCHE BANK AG	-0.010**	-0.007**	-0.003	-0.001	-0.000	-0.001	0.002	0.000	0.002
GREECE	NATIONAL BANK OF GREECE	0.000	0.001	-0.001	-0.001	-0.004	0.003	-0.016	-0.016	-0.000
ITALY	BANCO POPOLARE - S.C.	-0.013**	-0.007*	-0.006	0.006	0.004	0.002	-0.010	-0.001	-0.009*
	INTESA SANPAOLO S.p.A	-0.016***	-0.008**	-0.009**	0.009	0.004	0.005	-0.005	-0.001	-0.005
	UNICREDIT S.p.A	-0.012	-0.008	-0.004	0.007	0.004	0.003	-0.005	-0.001	-0.004
PORTUGAL	BANCO COMERCIAL PORTUGUÊS, SA	-0.005	-0.012*	0.007	0.004	-0.001	0.006	-0.003	-0.006	0.002
	BANCO BPI SA	-0.021***	-0.018***	-0.002	-0.009**	-0.009***	-0.001	-0.013***	0.001	-0.014***
SPAIN	BBVA	-0.013***	-0.006***	-0.006**	0.002	0.002	-0.000	-0.003	0.000	-0.003
	BANKINTER, S.A.	-0.005	-0.003	-0.002	0.002	0.001	0.001	-0.002	0.001	-0.002
	BANCO POPULAR ESPAÑOL, S.A.	-0.002	-0.004	0.002	-0.004	-0.005	0.001	0.001	0.000	0.001
	BANCO DE SABADELL, S.A.	-0.019***	-0.006**	-0.013***	0.002	0.001	0.002	0.000	0.001	-0.001
	BANCO SANTANDER S.A.	-0.008**	-0.008***	-0.001	0.002	0.001	0.000	-0.001	-0.000	-0.001
SWEDEN	SKANDINAVISKA ENSKILDA BANKEN AB	-0.007***	-0.003**	-0.004**	-0.000	0.000	-0.000	0.001	0.001	0.001
Nb. Of banks: 4		**Non-tested banks**								
AUSTRIA	OBERBANK AG	0.001	0.001	0.000	0.001	0.001	0.000	0.001	0.001	0.000
ITALY	BANCA POP MILANO	-0.013	-0.008	-0.005	0.007	0.002	0.005	-0.007	-0.001	-0.006
	BANCA CARIGE	-0.012**	-0.008**	-0.004	0.004	0.003	0.001	-0.005	-0.001	-0.005
SPAIN	CAIXABANK SA	-0.010	-0.007	-0.003	-0.001	0.001	-0.002	0.005	0.001	0.004

*Note: this table reports the secured bonds' cumulative abnormal returns (CAR) over the events windows (-2,2), (-2,-1) and (0,2) for each individual bank. ***,**,* indicate respectively significant at 1%, 5% and 10%.*

Table 7: Unsecured bonds' cumulative abnormal returns for individual

Country	Stress test events	January 13, 2011: first announcement			April 04, 2011: capital definition			July 15, 2011: results disclosure		
		CAR(-2,2)	CAR(-2,-1)	CAR(0,2)	CAR(-2,2)	CAR(-2,-1)	CAR(0,2)	CAR(-2,2)	CAR(-2,-1)	CAR(0,2)
Nb. Of banks: 29		**Tested banks**								
AUSTRIA	ERSTE BANK GROUP (EBG)	-0.005***	-0.003***	-0.002*	-0.001	-0.001	-0.000	0.001	-0.000	0.001
	RAIFFEISEN BANK INTERNATIONAL	-0.007***	-0.003**	-0.004**	-0.002	-0.002	-0.000	-0.006***	-0.002	-0.004**
BELGIUM	KBC BANK	-0.009**	-0.000	-0.009***	0.009**	-0.004	0.014***	0.001	0.000	0.001
BRITAIN	HSBC HOLDINGS plc	-0.007**	-0.003*	-0.004	-0.000	0.000	-0.000	0.001	0.001	-0.000
DENMARK	DANSKE BANK	-0.003*	-0.001	-0.002	-0.000	-0.000	-0.000	-0.000	-0.000	0.000
	JYSKE BANK	-0.000	0.000	-0.000	-0.001	-0.001	0.000	-0.000	-0.000	-0.000
FINLAND	POHJOLA BANK-A	-0.009***	-0.005**	-0.004	-0.001	-0.000	-0.001	0.001	0.001	0.000
FRANCE	BNP PARIBAS	-0.003***	-0.002***	-0.001*	-0.000	0.000	-0.000	-0.000	-0.000	-0.000
	CREDIT AGRICOLE	-0.004	-0.003*	-0.001	-0.003	-0.001	-0.002	-0.000	-0.002	0.002
	SOCIETE GENERALE	-0.006*	-0.003*	-0.003	-0.002	-0.000	-0.002	-0.001	-0.000	-0.001
GERMANY	COMMERZBANK AG	-0.003*	-0.002**	-0.000	0.001	0.001	0.000	-0.001	-0.001	-0.000
	DEUTSCHE BANK AG	-0.003	-0.003*	0.000	-0.001	-0.000	-0.000	-0.001	-0.001	0.000
IRELAND	ALLIED IRISH BANKS PLC	0.027*	0.003	0.023**	0.020	0.011	0.009	-0.014	-0.007	-0.007
	BANK OF IRELAND	0.028	0.012	0.016	0.012	0.007	0.005	-0.020	-0.011	-0.008
ITALY	BANCA MONTE DEI PASCHI DI SIENA S.p.A	-0.004***	-0.003***	-0.002	0.002	0.001	0.001	-0.003**	-0.001	-0.003**
	BANCO POPOLARE - S.C.	-0.001	-0.001	-0.000	0.003	0.002	0.001	-0.006***	-0.003**	-0.003
	INTESA SANPAOLO S.p.A	-0.006***	-0.003*	-0.003*	0.002	0.002	-0.000	-0.007***	-0.004***	-0.003*
	UNIONE DI BANCHE ITALIANE SCPA	-0.003	-0.001	-0.002	0.004	-0.002	0.005**	-0.008***	-0.004**	-0.004*
	UNICREDIT S.p.A	-0.005***	-0.004***	-0.002	0.001	0.001	0.000	-0.005***	-0.002	-0.003**
PORTUGAL	BANCO COMERCIAL PORTUGUÊS, SA	0.002	0.001	0.002	0.016***	0.008*	0.008*	-0.036***	-0.010**	-0.026***
	BANCO BPI SA	0.009	0.003	0.006	-0.013	0.000	-0.013	0.001	0.001	0.000
SPAIN	BBVA	0.017**	0.004	0.013*	0.007	0.002	0.005	-0.013	-0.003	-0.011
	BANKINTER, S.A.	-0.001	-0.001	-0.001	0.002	0.001	0.001	-0.002	0.001	-0.003
	BANCO POPULAR ESPAÑOL, S.A.	0.001	0.000	0.001	-0.000	-0.000	0.000	-0.002	0.000	-0.003*
	BANCO DE SABADELL, S.A.	0.001	-0.000	0.001	-0.006*	-0.006***	0.000	-0.000	0.000	-0.001
SWEDEN	SWEDBANK AB (publ)	-0.007***	-0.003**	-0.004*	0.000	0.000	-0.000	0.001	0.000	0.001
	NORDEA BANK AB (publ)	-0.006**	-0.004**	-0.002	-0.000	-0.000	-0.000	0.000	0.000	-0.000
	SVENSKA HAN-A	-0.008**	-0.005**	-0.003	-0.001	-0.000	-0.000	0.000	-0.000	0.001
	SKANDINAVISKA ENSKILDA BANKEN AB	-0.005	-0.003	-0.002	-0.001	-0.000	-0.001	0.000	0.000	-0.000
Nb. Of banks: 9		**Non-tested banks**								
AUSTRIA	OBERBANK AG	0.000	0.000	0.000	-0.000	-0.000	0.000	0.000	0.000	0.000
BRITAIN	STANDARD CHARTER	-0.007**	-0.003	-0.004	-0.001	-0.000	-0.001	0.001	0.001	0.000
ITALY	BANCO DESIO	-0.012**	-0.001	-0.010***	-0.003	-0.002	-0.001	0.000	-0.002	0.002
	BANCA CARIGE	-0.000	-0.001	0.000	-0.000	0.000	-0.000	0.001	0.001	0.000
	MEDIOBANCA	-0.004*	-0.002*	-0.002	-0.000	-0.000	-0.000	-0.005**	-0.002	-0.003
	BANCA POP MILANO	-0.008***	-0.003***	-0.004***	0.001	0.001	0.000	-0.008***	-0.003***	-0.005***
NORWAY	SPAREBANKEN VEST	0.002	0.001	0.001	0.000	0.000	0.000	0.001	0.000	0.001
SPAIN	CAIXABANK SA	-0.004	-0.005	0.000	0.003	0.002	0.001	-0.001	0.000	-0.001
SWITHERLAND	UBS	-0.005**	-0.002	-0.004*	-0.001	0.000	-0.001	0.001	0.001	-0.000

*Note: this table reports the unsecured bonds' cumulative abnormal returns (CAR) over the events windows (-2,2), (-2,-1) and (0,2) for each individual bank. ***,**,* indicate respectively significant at 1%, 5% and 10%.*

Table 8: Subordinated bonds' cumulative abnormal returns for individual banks

Country	Stress test events	January 13, 2011: first announcement			April 04, 2011: capital definition			July 15, 2011: results disclosure		
		CAR(-2,2)	CAR(-2,-1)	CAR(0,2)	CAR(-2,2)	CAR(-2,-1)	CAR(0,2)	CAR(-2,2)	CAR(-2,-1)	CAR(0,2)
Nb. Of banks: 21		**Tested banks**								
AUSTRIA	ERSTE BANK GROUP (EBG)	0.002	-0.001	0.003	-0.001	0.000	-0.002	0.001	0.000	0.000
	RAIFFEISEN BANK INTERNATIONAL	0.001	0.001	0.001	0.000	-0.000	0.001	0.001	0.001	0.001
BRITAIN	HSBC HOLDINGS plc	0.007	0.003	0.004	0.003	0.003	0.000	0.005	0.004	0.001
	LLOYDS BANKING GROUP plc	-0.003	-0.003	0.000	0.003	0.001	0.001	0.000	0.002	-0.002
FRANCE	BNP PARIBAS	-0.005	-0.004	-0.001	0.002	0.001	0.000	-0.000	-0.000	0.000
	CREDIT AGRICOLE	-0.006	-0.007**	0.001	0.003	0.002	0.001	-0.004	-0.002	-0.002
	SOCIETE GENERALE	-0.007	-0.006**	-0.001	-0.005	0.001	-0.006	0.000	-0.000	0.001
GERMANY	COMMERZBANK AG	0.005	0.004	0.001	0.008	0.009	-0.001	-0.007	0.004	-0.011
	DEUTSCHE BANK AG	-0.003	-0.002	-0.001	-0.002	-0.001	-0.001	-0.002	-0.001	-0.001
HUNGARY	OTP BANK NYRT.	0.001	0.002	-0.000	0.004	0.002	0.002	0.005	0.002	0.003
IRELAND	BANK OF IRELAND	0.131**	0.083**	0.048	0.071	0.066*	0.004	0.024	0.008	0.016
ITALY	BANCA MONTE DEI PASCHI DI SIENA S.p.A	-0.003	-0.003	0.000	0.018**	0.011**	0.006	-0.015*	-0.002	-0.012**
	BANCO POPOLARE - S.C.	-0.011*	-0.011***	0.000	0.004	0.003	0.001	-0.005	-0.006	0.001
	INTESA SANPAOLO S.p.A	-0.001	0.002	-0.003	0.011**	0.007**	0.004	-0.009	-0.002	-0.007
	UNICREDIT S.p.A	-0.009	-0.008**	-0.001	0.010	0.007*	0.002	-0.006	0.003	-0.009*
PORTUGAL	BANCO ESPIRITO SANTO	-0.040	-0.010	-0.030	0.052**	0.025	0.026	-0.106***	0.000	-0.106***
SPAIN	BBVA	-0.002	-0.000	-0.002	0.009	0.006	0.003	0.001	-0.001	0.002
	BANKINTER, S.A.	0.002	0.001	0.001	0.005	-0.000	0.005	-0.002	-0.002	0.000
	BANCO DE SABADELL, S.A.	0.018	0.010	0.009	0.032**	0.015	0.017	0.009	0.004	0.005
	BANCO SANTANDER S.A.	-0.005	-0.002	-0.003	0.012	0.009	0.003	0.003	0.001	0.003
SWEDEN	NORDEA BANK AB (publ)	-0.002	-0.005	0.003	0.003	0.002	0.001	0.000	-0.002	0.003
Nb. Of banks: 3		**Non-tested banks**								
AUSTRIA	OBERBANK AG	0.000	0.000	0.000	0.000	-0.000	0.000	0.000	0.000	0.000
FRANCE	CIC	0.000	-0.003	0.003	-0.001	0.000	-0.001	0.000	-0.002	0.003
ITALY	BANCO DESIO	-0.000	0.000	-0.000	-0.002	-0.002	0.000	-0.001	-0.001	0.000

*Note: this table reports the subordinated bonds' cumulative abnormal returns (CAR) over the events windows (-2,2), (-2,-1) and (0,2) for each individual bank. ***,**,* indicate respectively significant at 1%, 5% and 10%.*

Table 9 opposes the tested banks and non-tested banks. It shows that during the events related to the signal generating process, on average, secured bondholders react negatively to the first announcement of the stress test but only for tested banks whereas unsecured bondholders have the same reaction for all banks, involved or not in the stress test. Subordinated bond holders do not react at all. The highest negative reaction is for secured bonds and tested banks probably because their holders worry about the collateral on which are backed their securities explaining their absence of reaction in the case of non-tested banks. At the capital definition announcement, the only significant and positive reaction is attributed to tested banks' subordinated bondholders as they positively value the future possible capital increase of banks as shareholders would do. When the signal is revealed to the financial market, unsecured bondholders have significant and negative reaction for both the group of tested and non-tested banks. They react globally without taking account which banks are tested. This reaction of unsecured bondholders can be explained by the fact that they are concerned about the sovereign risk dissemination beyond the bank specific stress test signal. These aggregate results confirm that subordinated and secured bondholders distinguish banks participating to the stress test from those that do not. They have a more specific approach than unsecured bondholders. Therefore, they are more likely to exert an effective market discipline during a crisis period.

Table 10 and Table 11 present the results of the sub-groups, PIIGS banks vs non PIIGS banks, higher stressed Core Tier1 banks vs lower stressed Core Tier1 banks. The first announcement of the stress test impacts negatively only secured and unsecured bonds and that, regardless of the sub-groups. The capital definition announcement impacts essentially the subordinated bonds, positively, and only for banks belonging to the PIIGS countries or for less capitalized banks. The disclosure of the results brings information to unsecured bondholders for banks belonging to PIIGS countries and to both unsecured bondholders and subordinated bondholders for the less capitalized banks. These outcomes confirm the heterogeneity of bondholders as it appears in their different reactions to the stress test events. In a global vision, unsecured bond holders appear to have the most pessimistic feelings and subordinated bond holders the less reaction at all to the successive announcements. One might even be tempted to bring the subordinated bonds and shareholders together due to their common scarcity of negative reactions but subordinated bond holders align with positive stockholders' reactions only once (for the capital definition announcement concerning PIIGS banks' bonds), which does not entail a similar behavior and a close way to exercise market discipline.

Table 9: Tested and non-tested bonds CAR according the different categories of bonds.

Events dates	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	CAR(-2,-1)	P-val	CAR(0,2)	P-val
	Tested banks (a)									**Non tested banks (b)**									**Mean equality test: (a) - (b)**					
	Secured bonds						Obs.: 87			Secured bonds						Obs.: 27			Secured bonds					
Jan. 13, 2011	-1.68***	0.00	-1.53	-1.48***	0.01	-1.55	-0.98*	0.09	-0.95	-0.75	0.19	-1.01	-0.93	0.11	-1.97*	-0.22	0.70	0.08	-0.93**	0.05	-0.57*	0.06	-0.76	0.13
Apr. 04, 2011	0.08	0.89	0.36	0.10	0.86	0.62	0.02	0.97	0.04	-0.03	0.96	-0.56	0.12	0.84	-0.07	-0.13	0.82	-0.98	0.11	0.47	-0.01	0.95	0.15*	0.08
Jul. 15, 2011	-0.36	0.53	-0.50	0.05	0.93	0.21	-0.51	0.37	-0.83	0.02	0.97	-0.72	0.15	0.79	-0.23	-0.10	0.87	-1.17	-0.38**	0.03	-0.10	0.48	-0.41*	0.07
	Unsecured bonds						Obs.: 679			Unsecured bonds						Obs.: 70			Unsecured bonds					
Jan. 13, 2011	-0.81***	0.00	-1.53	-0.87***	0.00	-1.25	-0.34	0.19	-1.28	-0.96***	0.00	-1.92*	-0.85***	0.01	-1.83*	-0.55*	0.10	-1.44	0.15	0.61	-0.04	0.91	0.21	0.24
Apr. 04, 2011	-0.01	0.96	0.47	0.00	1.00	0.79	-0.02	0.95	-0.11	-0.12	0.71	-0.06	-0.13	0.69	0.20	-0.05	0.87	-0.56	0.11	0.81	0.13	0.84	0.04	0.87
Jul. 15, 2011	-0.64**	0.02	-1.02	-0.49*	0.06	-0.66	-0.43*	0.10	-0.98	-0.82***	0.01	-1.84*	-0.84***	0.01	-1.86*	-0.38	0.26	-0.87	0.17	0.56	0.34	0.18	-0.06	0.82
	Subordinated bonds						Obs.: 131			Subordinated bonds						Obs.: 22			Subordinated bonds					
Jan. 13, 2011	-0.37	0.20	-1.19	-0.38	0.19	-1.03	-0.17	0.55	-0.80	0.04	0.92	1.07	0.02	0.96	1.49	0.03	0.92	0.10	-0.41*	0.06	-0.41*	0.09	-0.21	0.38
Apr. 04, 2011	0.33	0.25	0.95	0.48*	0.10	1.34	0.04	0.89	-0.11	-0.16	0.65	0.51	-0.32	0.37	0.97	0.05	0.89	0.23	0.51**	0.03	0.84***	0.00	-0.02	0.92
Jul. 15, 2011	-0.29	0.32	-0.38	-0.08	0.78	0.32	-0.31	0.28	-0.89	-0.02	0.95	1.25	0.04	0.92	1.52	-0.06	0.87	0.68	-0.27	0.24	-0.12	0.61	-0.25	0.24

*Note: This table reports the standardized average bond cumulative abnormal returns over the events windows (-2,2), (-2,-1) and (0,2) for the sample of tested and non-tested banks using adjusted-Patell statistic. Grank t is the t-statistic of generalized rank test. January 13, 2011 is the first announcement date of the stress test; April 08, 2011 is the capital definition date; July 15, 2011 is the stress test results publication date. ***,**,* indicate respectively significant at 1%, 5% and 10%. Obs. is the number of bonds per category. We report also the mean equality test between the CAR of the two groups.*

Table 10: PIIGS tested and non PIIGS tested banks bonds CAR according the different categories of bonds.

Events dates	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	CAR(-2,-1)	P-val	CAR(0,2)	P-val
	PIIGS tested banks (a)									**Non-PIIGS tested banks (b)**									**Mean equality test: (a) - (b)**					
	Secured bonds						Obs.: 64			Secured bonds						Obs.: 23			Secured bonds					
Jan. 13, 2011	-1.89***	0.00	-1.57	-1.72***	0.01	-1.77*	-1.06	0.11	-0.79	-1.09**	0.02	-0.95	-0.82*	0.07	-0.41	-0.75*	0.10	-1.21	-0.80	0.15	-0.93***	0.01	-0.31	0.62
Apr. 04, 2011	0.15	0.81	0.50	0.12	0.85	0.51	0.10	0.88	0.28	-0.13	0.78	-0.19	0.05	0.91	0.82	-0.21	0.65	-0.78	0.28	0.13	0.07	0.81	0.31***	0.00
Jul. 15, 2011	-0.48	0.46	-0.84	0.01	0.99	-0.05	-0.63	0.33	-1.01	-0.02	0.97	0.79	0.17	0.70	0.99	-0.16	0.72	-0.02	-0.46**	0.02	-0.17	0.26	-0.47*	0.07
	Unsecured bonds						Obs.: 260			Unsecured bonds						Obs.: 419			Unsecured bonds					
Jan. 13, 2011	-0.78**	0.03	-1.84*	-0.69*	0.06	-1.55	-0.46	0.21	-1.56	-0.82***	0.00	-1.11	-0.99***	0.00	-0.87	-0.27	0.23	-0.91	0.04	0.83	0.33	0.21	-0.19*	0.09
Apr. 04, 2011	0.65*	0.07	1.08	0.53	0.14	1.03	0.41	0.26	0.67	-0.42*	0.06	-0.03	-0.33	0.14	0.51	-0.28	0.21	-0.64	1.08***	0.00	0.89**	0.05	0.71***	0.00
Jul. 15, 2011	-1.68***	0.00	-2.32**	-1.22***	0.00	-1.87*	-1.19***	0.00	-2.07**	0.01	0.97	0.01	-0.04	0.87	0.26	0.04	0.85	-0.11	-1.71***	0.00	-1.21***	0.00	-1.26***	0.00
	Subordinated bonds						Obs.: 34			Subordinated bonds						Obs.: 97			Subordinated bonds					
Jan. 13, 2011	-0.48	0.31	-1.15	-0.48	0.31	-1.20	-0.23	0.63	-0.29	-0.33	0.19	-1.12	-0.35	0.18	-0.85	-0.15	0.55	-1.01	-0.16	0.43	-0.15	0.50	-0.09	0.69
Apr. 04, 2011	1.14**	0.02	1.90*	1.23***	0.01	1.75*	0.49	0.30	0.92	0.05	0.85	0.34	0.22	0.39	1.00	-0.11	0.65	-0.68	1.09***	0.00	1.01***	0.00	0.60***	0.00
Jul. 15, 2011	-1.01**	0.03	-1.31	-0.44	0.36	-0.40	-0.96**	0.04	-1.53	-0.04	0.89	0.17	0.04	0.86	0.69	-0.08	0.74	-0.46	-0.97***	0.00	-0.49**	0.02	-0.90***	0.00

*Note: This table reports the standardized average bond cumulative abnormal returns over the events windows (-2,2), (-2,-1) and (0,2) for the sample of PIIGS tested non PIIGS tested banks using adjusted-Patell statistic. Grank t is the t-statistic of generalized rank test. January 13, 2011 is the first announcement date of the stress test; April 08, 2011 is the capital definition date; July 15, 2011 is the stress test results publication date. ***,**,* indicate respectively significant at 1%, 5% and 10%. Obs. is the number of bonds per category. We report also the mean equality test between the CAR of the two groups.*

Table 11: Groups of tested banks CT1 < median=7.69% and tested banks CT1 > median = 7.69%bonds CAR according the different categories of bonds.

Events dates	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	CAR(-2,-1)	P-val	CAR(0,2)	P-val
	Tested banks' CT1 < median (a)									**Tested banks' CT1 > median (b)**									**Mean equality test: (a) - (b)**					
	Secured bonds						Obs.: 64			Secured bonds						Obs.: 23			Secured bonds					
Jan. 13, 2011	-1.90***	0.00	-1.30	-1.56***	0.01	-1.69*	-1.21**	0.04	-0.58	-1.57***	0.01	-1.61	-1.44***	0.01	-1.44	-0.87	0.14	-1.12	-0.33	0.53	-0.17	0.60	-0.34	0.55
Apr. 04, 2011	0.05	0.93	0.54	-0.15	0.80	0.35	0.18	0.75	0.54	0.09	0.87	0.25	0.23	0.70	0.74	-0.06	0.92	-0.23	-0.05	0.78	-0.38	0.13	0.24***	0.01
Jul. 15, 2011	-0.39	0.50	-0.70	-0.08	0.89	-0.32	-0.44	0.44	-0.70	-0.34	0.56	-0.38	0.12	0.84	0.48	-0.54	0.35	-0.88	-0.05	0.80	-0.20	0.15	0.10	0.69
	Unsecured bonds						Obs.: 260			Unsecured bonds						Obs.: 419			Unsecured bonds					
Jan. 13, 2011	-0.82***	0.01	-2.09**	-0.80***	0.01	-1.89*	-0.41	0.20	-1.48	-0.79***	0.00	0.03	-1.03***	0.00	0.39	-0.19	0.29	-0.46	-0.02	0.91	0.27	0.32	-0.22*	0.06
Apr. 04, 2011	0.26	0.41	0.48	0.30	0.34	0.66	0.09	0.77	0.07	-0.60***	0.00	0.29	-0.65***	0.00	0.77	-0.26	0.15	-0.41	0.87***	0.01	0.99**	0.04	0.35**	0.02
Jul. 15, 2011	-0.96***	0.00	-1.73*	-0.70**	0.03	-1.46	-0.68**	0.04	-1.46	0.05	0.77	0.64	-0.04	0.84	1.07	0.10	0.59	0.24	-1.02***	0.00	-0.68***	0.00	-0.78***	0.00
	Subordinated bonds						Obs.: 34			Subordinated bonds						Obs.: 97			Subordinated bonds					
Jan. 13, 2011	-0.40	0.24	-1.39	-0.37	0.28	-1.28	-0.22	0.52	-0.79	-0.34	0.23	-0.77	-0.40	0.16	-0.56	-0.12	0.67	-0.71	-0.06	0.71	0.01	0.94	-0.10	0.60
Apr. 04, 2011	0.50	0.14	0.96	0.71**	0.04	1.33	0.08	0.82	-0.04	0.12	0.66	0.79	0.20	0.47	1.16	-0.00	0.99	-0.19	0.38**	0.02	0.51***	0.00	0.08	0.49
Jul. 15, 2011	-0.53	0.12	-0.96	-0.19	0.57	0.00	-0.53	0.12	-1.23	0.01	0.99	0.43	0.06	0.84	0.68	-0.04	0.89	-0.31	-0.53***	0.00	-0.26	0.18	-0.50***	0.00

*Note: This table reports the standardized average bond cumulative abnormal returns over the events windows (-2,2), (-2,-1) and (0,2) for the sample of tested CT1 < median and tested banks CT1 > median using adjusted-Patell statistic. Grank t is the t-statistic of generalized rank test. January 13, 2011 is the first announcement date of the stress test; April 08, 2011 is the capital definition date; July 15, 2011 is the stress test results publication date. ***,**,* indicate respectively significant at 1%, 5% and 10%. Obs. is the number of bonds per category. We report also the mean equality test between the CAR of the two groups.*

1.3.4. Stockholders and bondholders reactions to the 2014 EU stress test conducted in a non-crisis period

We consider the group of tested and non-tested banks and investigate the reaction of stockholders and bondholders to the stress test conducted by the EBA in 2014. The sovereign debt crisis is over and financial markets are calm. In Table 12, we present the CAR of stocks and bonds for the two groups considered around three event dates: the first announcement and the methodology announcement (respectively on January 31, 2014 and April 29, 2014) considered as the signal generating process and the results disclosure (on October 26, 2014) which is the signal. For this 2014 stress test, we have 36 tested banks and 10 non-tested banks for which the stocks and bonds prices are available.

During the signal generating process (first announcement and methodology), we remark that both stockholders and bondholders do not react to the announcements (there is no significant CAR). This could be explained by the fact that the uncertainty and the need of information are lower in a non-crisis period. The expected transparency resulting from the stress test is not valued by the investors. When the signal is provided (on the results date when quantitative data are disclosed), stockholders reacts negatively while bondholders do not react. This reaction of stockholders shows that even in a non-crisis period, stockholders value the specific information disclosed.

Table 12: Stocks and bonds cumulative abnormal returns (CAR) for the banks that participated to the 2014 European Banking Authority stress test (tested banks) and those that did not (non-tested banks).

Events dates	Stock									Bond								
	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t
	Obs.: 36			**Tested banks (a)**												Obs.: 36		
Jan. 31, 2014	0.02	0.96	-0.05	0.16	0.66	0.22	-0.10	0.78	-0.20	0.27	0.66	0.64	0.26	0.67	0.70	0.15	0.81	0.42
Apr. 29, 2014	-0.27	0.43	-0.48	-0.40	0.25	-0.95	-0.03	0.94	0.27	0.01	0.99	-0.00	-0.01	0.99	-0.11	0.02	0.98	0.23
Oct. 27, 2014	-0.55	0.12	-1.20	0.36	0.30	1.14	-1.01***	0.00	-1.91*	-0.09	0.89	-0.27	-0.21	0.73	-0.43	0.06	0.92	0.08
	Obs.: 10			**Non-tested banks (b)**												Obs.: 10		
Jan. 31, 2014	-0.03	0.92	-0.17	0.21	0.54	0.30	-0.22	0.52	-0.60	0.11	0.81	0.18	0.10	0.83	0.12	0.06	0.89	0.20
Apr. 29, 2014	-0.22	0.52	-0.43	-0.32	0.34	-1.39	-0.02	0.94	-0.14	-0.27	0.56	-0.66	-0.83*	0.08	-0.70	0.32	0.49	0.16
Oct.27, 2014	-0.29	0.39	-0.60	0.07	0.83	0.39	-0.44	0.20	-0.92	-0.44	0.35	-1.21	-0.45	0.34	-1.25	-0.21	0.66	-0.54
	Mean equality test: (a) - (b)																	
Jan. 31, 2014	0.05	0.86		-0.05	0.89		0.12	0.73		0.16	0.55		0.15	0.40		0.08	0.71	
Apr. 29, 2014	-0.06	0.85		-0.08	0.78		-0.00	0.99		0.28	0.14		0.82*	0.06		-0.30	0.19	
Oct.27, 2014	-0.26	0.44		0.29	0.32		-0.57	0.16		0.35*	0.09		0.24	0.13		0.27	0.18	

*Note: This table reports the standardized average stock and bond cumulative abnormal returns over the events windows (-2,2), (-2,-1) and (0,2) for the sample of tested banks and non-tested banks over three events dates using adjusted-Patell statistic. Grank t is the t-statistic of generalized rank test. January 31, 2014 is the first announcement date of the stress test; April 29, 2014 is the methodology announcement date; October 27, 2014 is the stress test results publication date. ***,**,* indicate respectively significant at 1%, 5% and 10%. Obs. is the number of banks in the sample. We report also the mean equality test between the CAR of the two groups*

1.4. Robustness checks

We perform several robustness checks. First, we classify tested banks by their level of exposure to the PIIGS countries sovereign debt[14]. We present the results in Appendix in Table A3. Bondholders have strong negative reaction only on the highly exposed banks on the results date (the signal) while on the previous events (the signal generating process), they react negatively for the two groups of banks but with a stronger reaction for the less exposed banks. The majority of highly exposed banks are from PIIGS countries explaining the different reactions of bondholders that we found in section 3.2.2. for these two groups of banks. For stockholders, there is no significant reaction for these two groups of banks on the results date. Thus, our results are quite similar to those obtained in 3.2.2 and confirm that bondholders learn information from the stress test disclosure in terms of sovereign debt exposure.

Second, we check the robustness of the results obtained on higher stressed Core Tier1 banks vs lower stressed Core Tier1 banks presented in 3.2.3. First, we conduct the same analysis considering the CT1 after mitigating measures rather than before mitigating measures. The results are presented in Appendix in Table A4 and are very close from the ones obtained in the case of the differentiation by CT1 before mitigating measures. Second, considering the CT1 before mitigating measures, we modify the criterion to separate banks with higher Core Tier 1 from banks with lower Core Tier 1 ratio. Rather than considering the median, we separate the bottom 9 from the top 9 banks classified by the CT1 before the mitigating measures. We consider also the bottom 14 and top 14 banks classified by CT1 before the mitigating measures. As in our main analysis, the results presented in Appendix in Table A5 and Table A6 show that both stockholders and bondholders learn about the stress test results.

Finally, as we present the bond CAR by using the *Firm Level Approach*, we also conduct the same analysis by using the *Bonds Level Approach*. We remark that the conclusions are similar (see Tables A7-A13 in Appendix).

[14] The sovereign debt exposures are from banks' balance sheet data on December 31, 2010 published in EBA's stress test results disclosure on July 15, 2011.

1.5. Conclusion

In this paper, we compare the behavior of stockholders and bondholders to information disclosure during crisis period. More precisely, we investigate if they are able to specifically analyze information in a period of financial distress. We focus on the stress test information as stress tests are supposed to bring transparency on banks and the European 2011 banks stress test is conducted during the European sovereign debt crisis period. We consider two kinds of information: the stress test pre-results announcements that are considered as the signal generating process and the disclosure of the quantitative data from the stress test results that is considered as the signal provided to the market. We then analyze the stockholders and bondholders reactions to the signal generating process and to the signal. We find that during the signal generating process, stockholders value the future benefits in terms of transparency for tested banks and that this expected transparency effect outweighs the dilution effect that could result. By contrast, bondholders react negatively to the stress test first announcement for all banks. They seem more influenced by the general context and this announcement exacerbates their negative perception of the overall banking system. Thus, in terms of market discipline, stock holders are better players than bondholders in crisis time as they rationally react according to bank specific characteristics. However, among the different bondholders, we show that subordinated bondholders have a more specific approach. Therefore, they are likely to exert an effective market discipline during a crisis period.

Considering the disclosure of information, both bondholders and stockholders learn information for some groups of banks. Thus, this study shows the importance of increasing transparency during crisis period. Indeed, some market participants are able to rationally analyze the specific information revealed and then impose market discipline during this time of turbulence.

Appendix:

Table A1: Sample of tested and non-tested banks

Country	Bank name	Tested or non-tested	CT1 ratio from 2011 EBA's stress test results before mitigating measures for tested banks: median = 7.69%	CT1 ratio from 2011 EBA's stress test results after mitigating measures for tested banks: median = 7.83%
Austria	ERSTE BANK GROUP (EBG)	tested	8.14%	8.14%
	OBERBANK AG	Non tested		
	RAIFFEISEN BANK INTERNATIONAL	tested	7.80%	7.80%
Belgium	KBC BANK	tested	10.04%	10.04%
United Kingdom	HSBC HOLDINGS plc	tested	8.46%	8.46%
	LLOYDS BANKING GROUP plc	tested	7.72%	7.72%
	STANDARD CHARTER	Non tested		
Denmark	DANSKE BANK	tested	11.14%	13.01%
	JYSKE BANK	tested	12.77%	12.77%
Finland	POHJOLA BANK-A	tested	11.59%	11.59%
France	BNP PARIBAS	tested	7.85%	7.85%
	CREDIT AGRICOLE	tested	8.48%	8.48%
	CIC	Non tested		
	SOCIETE GENERALE	tested	6.56%	6.56%
Germany	COMMERZBANK AG	tested	7.44%	6.37%
	DEUTSCHE BANK AG	tested	6.55%	6.55%
Greece	NATIONAL BANK OF GREECE	tested	7.67%	7.67%
Hungary	OTP BANK NYRT.	tested	13.64%	13.64%
Ireland	ALLIED IRISH BANKS PLC	tested	-2.81%	10.04%
	BANK OF IRELAND	tested	3.39%	7.11%
Italy	BANCO DESIO	Non tested		
	BANCA MONTE DEI PASCHI DI SIENA S.p.A	tested	4.67%	6.30%
	BANCO POPOLARE - S.C.	tested	5.01%	5.68%
	BANCA CARIGE	Non tested		
	INTESA SANPAOLO S.p.A	tested	7.38%	8.90%
	MEDIOBANCA	Non tested		
	BANCA POP MILANO	Non tested		
	UNIONE DI BANCHE ITALIANE SCPA	tested	6.36%	7.43%
	UNICREDIT S.p.A	tested	6.55%	6.67%
Norway	SPAREBANKEN VEST	Non tested		
Portugal	BANCO COMERCIAL PORTUGUÊS, SA	tested	3.61%	5.42%
	BANCO BPI SA	tested	6.65%	6.65%
	BANCO ESPIRITO SANTO	tested	5.07%	5.07%
Spain	BBVA	tested	9.19%	9.19%
	BANKINTER, S.A.	tested	5.28%	5.28%
	CAIXABANK SA	Non tested		
	BANCO POPULAR ESPAÑOL, S.A.	tested	5.19%	5.33%
	BANCO DE SABADELL, S.A.	tested	5.01%	5.73%
	BANCO SANTANDER S.A.	tested	8.35%	8.35%
Sweden	NORDEA BANK AB (publ)	tested	9.53%	9.53%
	SKANDINAVISKA ENSKILDA BANKEN AB	tested	10.50%	10.50%
	SVENSKA HAN-A	tested	8.63%	8.63%
	SWEDBANK AB (publ)	tested	9.41%	9.41%
Switzerland	UBS	Non tested		

Table A2: Repartition of bonds issued between banks tested and non-tested according the different categories of bonds.

Country	Bank name	Categories of bonds			Total	Tested or non-tested
		Secured	Unsecured	Subordinated		
Austria	ERSTE BANK GROUP (EBG)	16	112	20	148	tested
	OBERBANK AG	2	6	16	24	Non tested
	RAIFFEISEN BANK INTERNATIONAL		39	2	41	tested
Belgium	KBC BANK		1		1	tested
United Kingdom	HSBC HOLDINGS plc		1	3	4	tested
	LLOYDS BANKING GROUP plc			1	1	tested
	STANDARD CHARTER		1		1	Non tested
Denmark	DANSKE BANK	5	7		12	tested
	JYSKE BANK		4		4	tested
Finland	POHJOLA BANK-A		2		2	tested
France	CREDIT AGRICOLE		15	14	29	tested
	BNP PARIBAS		19	14	33	tested
	CIC			4	4	Non tested
	SOCIETE GENERALE		12	27	39	tested
Germany	COMMERZBANK AG		146	11	157	tested
	DEUTSCHE BANK AG	1	47	2	50	tested
Greece	NATIONAL BANK OF GREECE	1			1	tested
Hungary	OTP BANK NYRT.			2	2	tested
Ireland	ALLIED IRISH BANKS PLC		7		7	tested
	BANK OF IRELAND		2	1	3	tested
Italy	BANCO DESIO		6	2	8	Non tested
	BANCA MONTE DEI PASCHI DI SIENA S.p.A		12	3	15	tested
	BANCO POPOLARE - S.C.	1	13	6	20	tested
	BANCA CARIGE	1	4		5	Non tested
	INTESA SANPAOLO S.p.A	1	118	10	129	tested
	MEDIOBANCA		41		41	Non tested
	BANCA POP MILANO	1	4		5	Non tested
	UNIONE DI BANCHE ITALIANE SCPA		9		9	tested
	UNICREDIT S.p.A	2	79	8	89	tested
Norway	SPAREBANKEN VEST		1		1	Non tested
Portugal	BANCO COMERCIAL PORTUGUÊS, SA	3	7		10	tested
	BANCO BPI SA	2	2		4	tested
	BANCO ESPIRITO SANTO			1	1	tested
Spain	BBVA	21	2	1	24	tested
	BANKINTER, S.A.	2	3	2	7	tested
	CAIXABANK SA	23	6		29	Non tested
	BANCO POPULAR ESPAÑOL, S.A.	5	2		7	tested
	BANCO DE SABADELL, S.A.	11	4	1	16	tested
	BANCO SANTANDER S.A.	15		1	16	tested
Sweden	NORDEA BANK AB (publ)		6	1	7	tested
	SKANDINAVISKA ENSKILDA BANKEN AB	1	1		2	tested
	SVENSKA HAN-A		5		5	tested
	SWEDBANK AB (publ)		2		2	tested
Switzerland	UBS		1		1	Non tested
	Total	114	749	153	1016	

Table A3: Stock and bond cumulative abnormal returns (CAR) for the tested banks classified by two groups according their exposure to the PIIGS countries sovereign debt.

Events dates	Stock									Bond								
	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t
	Obs.: 17			**ExpoPIIGS_TA< median = 0.027 (a)**												Obs.: 17		
Jan. 13, 2011	0.90**	0.02	1.64	0.54	0.16	0.99	0.73*	0.06	1.35	-1.62**	0.02	-1.70*	-1.68**	0.02	-1.67*	-0.74	0.29	-1.08
Apr. 04, 2011	1.24***	0.00	2.33**	1.29***	0.00	2.17**	0.56	0.14	1.29	-0.13	0.85	-0.18	-0.01	0.99	0.01	-0.16	0.82	-0.16
Jul. 15, 2011	-0.24	0.53	-0.15	-0.47	0.21	-0.96	0.08	0.84	0.23	-0.10	0.89	-0.02	-0.11	0.88	-0.12	-0.04	0.96	0.01
	Obs.: 17			**ExpoPIIGS_TA>median = 0.027 (b)**												Obs.: 17		
Jan. 13, 2011	1.31***	0.00	2.09**	1.54***	0.00	2.51**	0.45	0.25	0.85	-1.30**	0.04	-1.46	-1.30**	0.04	-1.38	-0.63	0.33	-0.82
Apr. 04, 2011	1.13***	0.00	2.04**	1.49***	0.00	2.02**	0.25	0.52	0.78	0.85	0.19	1.31	0.39	0.54	0.71	0.78	0.22	1.09
Jul. 15, 2011	-0.36	0.36	-0.30	-0.42	0.28	-0.47	-0.12	0.75	0.04	-1.50**	0.02	-1.66*	-0.70	0.28	-0.94	-1.42**	0.03	-1.61
	Mean equality test: (a) - (b)																	
Jan. 13, 2011	-0.41	0.30		-1.00***	0.01		0.28	0.51		-0.32	0.51		-0.38	0.41		-0.11	0.77	
Apr. 04, 2011	0.11	0.84		-0.21	0.67		0.31	0.49		-0.98***	0.00		-0.40	0.26		-0.95***	0.00	
Jul. 15, 2011	0.12	0.79		-0.05	0.89		0.20	0.65		1.40***	0.00		0.55**	0.04		1.38***	0.00	

*Note: This table reports the standardized average stock and bond cumulative abnormal returns over the events windows (-2,2), (-2,-1) and (0,2) for the sample of tested banks classified by two groups according the level of their exposure to the PIIGS countries sovereign debt over three events dates. ExpoPIIGS_TA is the bank's exposure divided bank's total assets. Grank t is the t-statistic of generalized rank test. January 13, 2011 is the first announcement date of the stress test; April 08, 2011 is the capital definition date; July 15, 2011 is the stress test results publication date. (.) are the p-value.. ***,**,* indicate respectively significant at 1%, 5% and 10%. Obs. is the number of banks in the sample. We report also the mean equality test between the CAR of the two groups.*

Table A4: Stocks and bonds cumulative abnormal returns (CAR) for the tested banks classified by two groups according the level of their Core Tier 1 capital (CT1) after mitigating measures.

Events dates	Stock									Bond								
	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t
	Obs.: 17			**Tested banks' CT1 after < median = 7.8% (a)**												Obs.: 17		
Jan. 13, 2011	1.02***	0.01	2.11**	1.19***	0.00	2.31**	0.35	0.34	1.00	-1.35**	0.02	-1.73*	-1.46***	0.01	-1.80*	-0.56	0.34	-0.80
Apr. 04, 2011	1.00***	0.01	2.10**	1.33***	0.00	2.12**	0.21	0.57	0.74	0.42	0.48	0.65	0.22	0.71	0.41	0.37	0.53	0.67
Jul. 15, 2011	-0.75**	0.04	-1.05	-0.61*	0.10	-0.93	-0.48	0.20	-0.76	-1.46***	0.01	-1.60	-0.66	0.27	-0.91	-1.40**	0.02	-1.56
	Obs.: 17			**Tested banks' CT1 after > median = 7.8% (b)**												Obs.: 17		
Jan. 13, 2011	1.19***	0.00	1.70*	0.89**	0.02	1.33	0.82**	0.03	1.30	-1.57**	0.03	-1.51	-1.51**	0.04	-1.34	-0.81	0.27	-1.12
Apr. 04, 2011	1.37***	0.00	2.44**	1.45***	0.00	2.22**	0.60*	0.10	1.30	0.29	0.69	0.42	0.16	0.83	0.29	0.25	0.73	0.23
Jul. 15, 2011	0.16	0.66	0.46	-0.28	0.43	-0.62	0.44	0.23	0.89	-0.13	0.86	-0.10	-0.14	0.85	-0.17	-0.06	0.94	-0.06
	Mean equality test: (a) - (b)																	
Jan. 13, 2011	-0.17	0.67		0.29	0.47		-0.47	0.27		0.22	0.66		0.05	0.92		0.25	0.52	
Apr. 04, 2011	-0.37	0.50		-0.11	0.82		-0.39	0.39		0.13	0.71		0.05	0.88		0.12	0.72	
Jul. 15, 2011	-0.91**	0.04		-0.33	0.39		-0.92**	0.03		-1.33***	0.00		-0.48*	0.08		-1.34***	0.00	

*Note: This table reports the standardized average stock and bond cumulative abnormal returns over the events windows (-2,2), (-2,-1) and (0,2) for the sample of tested banks classified by two groups according the level of their CT1 after mitigating measures over three events dates using adjusted-Patell statistic. Grank t is the t-statistic of generalized rank test. January 13, 2011 is the first announcement date of the stress test; April 08, 2011 is the capital definition date; July 15, 2011 is the stress test results publication date. ***,**,* indicate respectively significant at 1%, 5% and 10%. Obs. is the number of banks in the sample. We report also the mean equality test between the CAR of the two groups.*

Table A5: Stock and bond cumulative abnormal returns (CAR) for the group of tested banks bottom 9 and top 9 CT1 before mitigating measures.

Events dates	Stock									Bond								
	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t
	Obs.: 9			**Bottom 9 CT1 before (a)**												Obs.: 9		
Jan. 13, 2011	0.72	0.11	1.15	0.99**	0.03	1.68*	0.13	0.77	0.22	-0.66	0.31	-0.86	-0.84	0.20	-1.19	-0.18	0.78	-0.08
Apr. 04, 2011	0.71	0.12	1.48	0.84*	0.06	0.95	0.24	0.59	0.81	1.10*	0.09	1.65	0.84	0.20	1.42	0.75	0.25	1.48
Jul. 15, 2011	-0.73	0.11	-1.21	-0.68	0.13	-1.32	-0.40	0.38	-0.24	-1.61***	0.01	-1.66	-0.65	0.32	-0.98	-1.63***	0.01	-1.70*
	Obs.: 9			**Top 9 CT1 before (b)**												Obs.: 9		
Jan. 13, 2011	1.27***	0.00	1.66	0.63	0.14	0.93	1.15***	0.01	1.80*	-1.79***	0.01	-1.82*	-1.35*	0.07	-1.36	-1.23*	0.09	-1.66
Apr. 04, 2011	1.68***	0.00	2.61**	1.31***	0.00	2.15**	1.13***	0.01	1.92*	0.21	0.77	0.23	-0.15	0.84	-0.16	0.40	0.58	0.25
Jul. 15, 2011	0.18	0.66	0.39	-0.32	0.46	-0.57	0.50	0.24	0.78	0.13	0.86	0.26	0.13	0.86	0.22	0.06	0.93	0.20
	Mean equality test: (a) - (b)																	
Jan. 13, 2011	-0.55	0.40		0.36	0.50		-1.02	0.15		1.13	0.14		0.51	0.39		1.05*	0.10	
Apr. 04, 2011	-0.97	0.21		-0.47	0.47		-0.88	0.20		0.89**	0.04		0.99**	0.03		0.35	0.48	
Jul. 15, 2011	-0.91*	0.08		-0.37	0.42		-0.89	0.13		-1.74***	0.00		-0.71**	0.04		-1.69***	0.01	

*Note: This table reports the standardized average stock and bond cumulative abnormal returns over the events windows (-2,2), (-2,-1) and (0,2) for the sample of tested banks classified by Bottom 9 and Top 9 CT1 before mitigating measures over three events dates. Grank t is the t-statistic of generalized rank test. January 13, 2011 is the first announcement date of the stress test; April 08, 2011 is the capital definition date; July 15, 2011 is the stress test results publication date. (.) are the p-value.. ***,**,* indicate respectively significant at 1%, 5% and 10%. Obs. is the number of banks in the sample. We report also the mean equality test between the CAR of the two groups.*

Table A6: Stock and bond cumulative abnormal returns (CAR) for the group of tested banks bottom 14 and top 14 CT1 before mitigating measures.

Events dates	Stock									Bond								
	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t
	Obs.: 14			**Bottom 14 CT1 before (a)**												Obs.: 14		
Jan. 13, 2011	1.06***	0.01	1.94*	1.29***	0.00	2.29**	0.32	0.43	0.83	-1.15*	0.07	-1.39	-1.41**	0.03	-1.58	-0.35	0.58	-0.51
Apr. 04, 2011	1.13***	0.01	2.11**	1.40***	0.00	1.88*	0.33	0.42	0.99	0.63	0.32	1.03	0.40	0.52	0.79	0.49	0.44	0.88
Jul. 15, 2011	-0.72*	0.08	-1.16	-0.73*	0.07	-1.24	-0.34	0.41	-0.50	-1.55**	0.02	-1.67*	-0.64	0.31	-0.94	-1.53**	0.02	-1.65
	Obs.: 14			**Top 14 CT1 before (b)**												Obs.: 14		
Jan. 13, 2011	1.15***	0.00	1.69*	0.82**	0.03	1.17	0.83**	0.03	1.31	-1.73**	0.02	-1.63	-1.60**	0.04	-1.39	-0.95	0.21	-1.22
Apr. 04, 2011	1.59***	0.00	2.78***	1.41***	0.00	2.47**	0.92***	0.01	1.74*	0.15	0.84	0.18	-0.03	0.97	0.01	0.22	0.77	0.08
Jul. 15, 2011	0.20	0.59	0.52	-0.31	0.41	-0.66	0.50	0.18	0.98	0.11	0.89	0.20	0.05	0.95	0.09	0.10	0.89	0.21
	Mean equality test: (a) - (b)																	
Jan. 13, 2011	-0.09	0.84		0.47	0.31		-0.51	0.31		0.58	0.30		0.20	0.72		0.60	0.17	
Apr. 04, 2011	-0.46	0.40		-0.01	0.98		-0.59	0.20		0.48	0.22		0.43	0.26		0.27	0.51	
Jul. 15, 2011	-0.92**	0.03		-0.43	0.26		-0.84**	0.05		-1.66***	0.00		-0.64**	0.02		-1.63***	0.00	

*Note: This table reports the standardized average stock and bond cumulative abnormal returns over the events windows (-2,2), (-2,-1) and (0,2) for the sample of tested banks classified by Bottom 14 and Top 14 CT1 before mitigating measures over three events dates. Grank t is the t-statistic of generalized rank test. January 13, 2011 is the first announcement date of the stress test; April 08, 2011 is the capital definition date; July 15, 2011 is the stress test results publication date. (.) are the p-value.. ***,**,* indicate respectively significant at 1%, 5% and 10%. Obs. is the number of banks in the sample. We report also the mean equality test between the CAR of the two groups.*

Table A7: Stocks and bonds cumulative abnormal returns (CAR) for the banks that participated to the 2011 European Banking Authority stress test (tested banks) and those that did not (non-tested banks) using *Bond Level Approach* for the calculation of bonds' CAR. .

Events dates	Stock									Bond								
	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t
	Obs.: 34			**Tested banks (a)**												Obs.: 897		
Jan. 13, 2011	1.10***	0.00	2.33**	1.04***	0.00	2.15**	0.59*	0.08	1.38	-0.83***	0.00	-1.53	-0.86***	0.00	-1.31	-0.38	0.18	-1.19
Apr. 04, 2011	1.18***	0.00	2.76***	1.39***	0.00	2.68***	0.41	0.22	1.30	0.05	0.87	0.54	0.08	0.77	0.87	-0.00	0.99	-0.09
Jul. 15, 2011	-0.30	0.37	-0.31	-0.45	0.18	-0.92	-0.02	0.95	0.14	-0.56**	0.05	-0.87	-0.38	0.18	-0.39	-0.42	0.14	-0.97
	Obs.: 10			**Non-tested banks (b)**												Obs.: 119		
Jan. 13, 2011	0.27	0.46	0.89	0.33	0.37	1.21	0.09	0.82	0.50	-0.73**	0.02	-1.27	-0.71**	0.02	-1.47	-0.37	0.22	-0.82
Apr. 04, 2011	0.87**	0.02	1.27	0.98***	0.01	1.82*	0.33	0.37	0.36	-0.11	0.72	-0.13	-0.11	0.72	0.33	-0.05	0.86	-0.67
Jul. 15, 2011	-0.54	0.14	-1.31	-0.20	0.59	-0.72	-0.54	0.14	-0.93	-0.48	0.11	-1.10	-0.46	0.13	-0.87	-0.25	0.40	-0.81
	Mean equality test: (a) - (b)																	
Jan. 13, 2011	0.83*	0.06		0.70	0.11		0.50	0.24		-0.10	0.64		-0.16	0.55		-0.01	0.94	
Apr. 04, 2011	0.31	0.57		0.41	0.40		0.07	0.87		0.16	0.61		0.20	0.67		0.05	0.74	
Jul. 15, 2011	0.24	0.57		-0.25	0.54		0.52	0.24		-0.08	0.72		0.08	0.67		-0.17	0.36	

*Note: This table reports the standardized average stock and bond cumulative abnormal returns over the events windows (-2,2), (-2,-1) and (0,2) for the sample of tested banks and non-tested banks over three events dates using adjusted-Patell statistic. Grank t is the t-statistic of generalized rank test. January 13, 2011 is the first announcement date of the stress test; April 08, 2011 is the capital definition date; July 15, 2011 is the stress test results publication date. ***,**,* indicate respectively significant at 1%, 5% and 10%. Obs. is the number of banks in the sample. We report also the mean equality test between the CAR of the two groups.*

Table A8: Stocks and bonds cumulative abnormal returns (CAR) for the tested banks belonging to PIIGS countries and tested banks belonging to non PIIGS countries using *Bond Level Approach* for the calculation of bonds' CAR.

Events dates	Stock									Bond								
	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t
	Obs.: 16			**PIIGS tested banks (a)**												Obs.: 358		
Jan. 13, 2011	1.21***	0.00	1.96*	1.47***	0.00	2.41**	0.37	0.35	0.70	-0.95**	0.02	-1.76*	-0.85**	0.04	-1.63	-0.54	0.18	-1.26
Apr. 04, 2011	1.14***	0.00	1.98**	1.53***	0.00	1.95*	0.23	0.56	0.72	0.61	0.14	1.06	0.52	0.20	1.01	0.36	0.37	0.62
Jul. 15, 2011	-0.40	0.31	-0.38	-0.43	0.28	-0.44	-0.17	0.66	-0.08	-1.40***	0.00	-1.88*	-0.93**	0.02	-1.26	-1.07***	0.01	-1.79*
	Obs.: 18			**Non-PIIGS tested banks (b)**												Obs.: 539		
Jan. 13, 2011	1.01***	0.01	1.72*	0.65*	0.09	1.10	0.78**	0.04	1.43	-0.75***	0.00	-1.13	-0.86***	0.00	-0.86	-0.27	0.23	-0.97
Apr. 04, 2011	1.22***	0.00	2.32**	1.26***	0.00	2.16**	0.56	0.14	1.28	-0.33	0.15	0.02	-0.21	0.34	0.64	-0.25	0.27	-0.67
Jul. 15, 2011	-0.20	0.59	-0.09	-0.46	0.22	-0.95	0.11	0.77	0.32	-0.00	1.00	0.09	-0.01	0.95	0.40	0.01	0.96	-0.17
	Mean equality test: (a) - (b)																	
Jan. 13, 2011	0.21	0.61		0.82**	0.04		-0.40	0.34		-0.21	0.17		0.03	0.89		-0.28***	0.01	
Apr. 04, 2011	-0.08	0.89		0.27	0.58		-0.33	0.47		0.94***	0.00		0.75**	0.03		0.62***	0.00	
Jul. 15, 2011	-0.20	0.66		0.03	0.93		-0.28	0.51		-1.41***	0.00		-0.93***	0.00		-1.10***	0.00	

*Note: This table reports the standardized average stock and bond cumulative abnormal returns over the events windows (-2,2), (-2,-1) and (0,2) for the sample of PIIGS tested banks and non-PIIGS tested banks over three events dates using adjusted-Patell statistic. Grank t is the t-statistic of generalized rank test. January 13, 2011 is the first announcement date of the stress test; April 08, 2011 is the capital definition date; July 15, 2011 is the stress test results publication date. ***,**,* indicate respectively significant at 1%, 5% and 10%. Obs. is the number of banks in the sample. We report also the mean equality test between the CAR of the two groups.*

Table A9: Stocks and bonds cumulative abnormal returns (CAR) for the tested banks classified by two groups according the level of their Core Tier 1 capital (CT1) using *Bond Level Approach* for the calculation of bonds' CAR.

Events dates	Stock									Bond								
	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t
	Obs.: 17			**Tested banks' CT1 < median = 7.69% (a)**												Obs.: 564		
Jan. 13, 2011	1.10***	0.00	2.02**	1.36***	0.00	2.50**	0.32	0.41	0.78	-0.82***	0.01	-1.98**	-0.78**	0.02	-1.84*	-0.43	0.19	-1.34
Apr. 04, 2011	0.86**	0.03	1.79*	1.34***	0.00	1.77*	0.03	0.94	0.54	0.28	0.38	0.56	0.33	0.30	0.74	0.10	0.76	0.10
Jul. 15, 2011	-0.80**	0.04	-1.08	-0.71*	0.07	-1.10	-0.47	0.22	-0.62	-0.88***	0.01	-1.58	-0.61*	0.06	-1.20	-0.65**	0.05	-1.40
	Obs.: 17			**Tested banks' CT1 > median = 7.69% (b)**												Obs.: 333		
Jan. 13, 2011	1.11***	0.00	1.78*	0.72**	0.05	1.13	0.86**	0.02	1.48	-0.85***	0.00	-0.53	-0.99***	0.00	-0.23	-0.30	0.21	-0.72
Apr. 04, 2011	1.50***	0.00	2.70***	1.44***	0.00	2.51**	0.78**	0.03	1.50	-0.35	0.14	0.39	-0.34	0.14	0.91	-0.18	0.45	-0.36
Jul. 15, 2011	0.21	0.55	0.54	-0.19	0.60	-0.46	0.43	0.23	0.80	-0.03	0.91	0.40	0.01	0.97	0.96	-0.04	0.87	-0.12
	Mean equality test: (a) - (b)																	
Jan. 13, 2011	-0.01	0.98		0.64	0.11		-0.54	0.20		0.03	0.86		0.23	0.27		-0.13	0.20	
Apr. 04, 2011	-0.64	0.24		-0.10	0.84		-0.75*	0.09		0.64***	0.01		0.70**	0.04		0.28***	0.01	
Jul. 15, 2011	-1.02**	0.02		-0.52	0.17		-0.90**	0.03		-0.86***	0.00		-0.63***	0.00		-0.62***	0.00	

*Note: This table reports the standardized average stock and bond cumulative abnormal returns over the events windows (-2,2), (-2,-1) and (0,2) for the sample of tested banks classified by two groups according the level of their CT1 over three events dates using adjusted-Patell statistic. Grank t is the t-statistic of generalized rank test. January 13, 2011 is the first announcement date of the stress test; April 08, 2011 is the capital definition date; July 15, 2011 is the stress test results publication date. ***,**,* indicate respectively significant at 1%, 5% and 10%. Obs. is the number of banks in the sample. We report also the mean equality test between the CAR of the two groups.*

Table A10: Stock and bond cumulative abnormal returns (CAR) for the tested banks classified by two groups according their exposure to the PIIGS countries sovereign debt using *Bond Level Approach* for the calculation of bonds' CAR.

Events dates	Stock									Bond								
	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t
	Obs.: 17			**ExpoPIIGS_TA< median = 0.027 (a)**												Obs.: 538		
Jan. 13, 2011	0.90**	0.02	1.64	0.54	0.16	0.99	0.73*	0.06	1.35	-0.74***	0.00	-1.12	-0.87***	0.00	-0.86	-0.26	0.24	-0.97
Apr. 04, 2011	1.24***	0.00	2.33**	1.29***	0.00	2.17**	0.56	0.14	1.29	-0.33	0.14	0.02	-0.21	0.35	0.65	-0.26	0.25	-0.68
Jul. 15, 2011	-0.24	0.53	-0.15	-0.47	0.21	-0.96	0.08	0.84	0.23	-0.00	1.00	0.09	-0.01	0.95	0.40	0.01	0.96	-0.17
	Obs.: 17			**ExpoPIIGS_TA>median = 0.027 (b)**												Obs.: 359		
Jan. 13, 2011	1.31***	0.00	2.09**	1.54***	0.00	2.51**	0.45	0.25	0.85	-0.96**	0.02	-1.76*	-0.85**	0.04	-1.62	-0.55	0.18	-1.27
Apr. 04, 2011	1.13***	0.00	2.04**	1.49***	0.00	2.02**	0.25	0.52	0.78	0.61	0.13	1.06	0.52	0.20	1.00	0.37	0.36	0.62
Jul. 15, 2011	-0.36	0.36	-0.30	-0.42	0.28	-0.47	-0.12	0.75	0.04	-1.40***	0.00	-1.87*	-0.93**	0.02	-1.25	-1.07***	0.01	-1.78*
	Mean equality test: (a) - (b)																	
Jan. 13, 2011	-0.41	0.30		-1.00***	0.01		0.28	0.51		0.21	0.16		-0.03	0.87		0.29***	0.01	
Apr. 04, 2011	0.11	0.84		-0.21	0.67		0.31	0.49		-0.95***	0.00		-0.74**	0.03		-0.64***	0.00	
Jul. 15, 2011	0.12	0.79		-0.05	0.89		0.20	0.65		1.41***	0.00		0.93***	0.00		1.10***	0.00	

*Note: This table reports the standardized average stock and bond cumulative abnormal returns over the events windows (-2,2), (-2,-1) and (0,2) for the sample of tested banks classified by two groups according the level of their exposure to the PIIGS countries sovereign debt over three events dates. ExpoPIIGS_TA is the bank's exposure divided bank's total assets. Grank t is the t-statistic of generalized rank test. January 13, 2011 is the first announcement date of the stress test; April 08, 2011 is the capital definition date; July 15, 2011 is the stress test results publication date. (.) are the p-value.. ***,**,* indicate respectively significant at 1%, 5% and 10%. Obs. is the number of banks in the sample. We report also the mean equality test between the CAR of the two groups.*

Table A11: Stocks and bonds cumulative abnormal returns (CAR) for the tested banks classified by two groups according the level of their Core Tier 1 capital (CT1) after mitigating measures using *Bond Level Approach* for the calculation of bonds' CAR.

Events dates	Stock									Bond								
	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t
	Obs.: 17			**Tested banks' CT1 after < median = 7.8% (a)**												Obs.: 470		
Jan. 13, 2011	1.02***	0.01	2.11**	1.19***	0.00	2.31**	0.35	0.34	1.00	-0.80***	0.01	-1.90*	-0.87***	0.00	-1.83*	-0.34	0.24	-1.17
Apr. 04, 2011	1.00***	0.01	2.10**	1.33***	0.00	2.12**	0.21	0.57	0.74	-0.11	0.69	0.20	-0.13	0.66	0.52	-0.05	0.87	-0.20
Jul. 15, 2011	-0.75**	0.04	-1.05	-0.61*	0.10	-0.93	-0.48	0.20	-0.76	-0.51*	0.08	-1.26	-0.28	0.33	-0.74	-0.44	0.13	-1.14
	Obs.: 17			**Tested banks' CT1 after > median =7.8% (b)**												Obs.: 427		
Jan. 13, 2011	1.19***	0.00	1.70*	0.89**	0.02	1.33	0.82**	0.03	1.30	-0.86***	0.00	-1.08	-0.85***	0.00	-0.72	-0.43	0.15	-1.16
Apr. 04, 2011	1.37***	0.00	2.44**	1.45***	0.00	2.22**	0.60*	0.10	1.30	0.22	0.45	0.85	0.31	0.29	1.20	0.04	0.89	0.02
Jul. 15, 2011	0.16	0.66	0.46	-0.28	0.43	-0.62	0.44	0.23	0.89	-0.61**	0.04	-0.43	-0.48*	0.10	-0.01	-0.40	0.17	-0.76
	Mean equality test: (a) - (b)																	
Jan. 13, 2011	-0.17	0.67		0.29	0.47		-0.47	0.27		0.06	0.70		-0.02	0.93		0.09	0.39	
Apr. 04, 2011	-0.37	0.50		-0.11	0.82		-0.39	0.39		-0.34	0.13		-0.45	0.18		-0.09	0.42	
Jul. 15, 2011	-0.91**	0.04		-0.33	0.39		-0.92**	0.03		0.10	0.50		0.21*	0.10		-0.03	0.79	

*Note: This table reports the standardized average stock and bond cumulative abnormal returns over the events windows (-2,2), (-2,-1) and (0,2) for the sample of tested banks classified by two groups according the level of their CT1 after mitigating measures over three events dates. Grank t is the t-statistic of generalized rank test. January 13, 2011 is the first announcement date of the stress test; April 08, 2011 is the capital definition date; July 15, 2011 is the stress test results publication date. (.) are the p-value.. ***,**,* indicate respectively significant at 1%, 5% and 10%. Obs. is the number of banks in the sample. We report also the mean equality test between the CAR of the two groups.*

Table A12: Stock and bond cumulative abnormal returns (CAR) for the group of tested banks bottom 9 and top 9 CT1 before mitigating measures using *Bond Level Approach* for the calculation of bonds' CAR.

Events dates	Stock									Bond								
	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t
	Obs.: 9			**Bottom 9 CT1 before (a)**												Obs.: 86		
Jan. 13, 2011	0.72	0.11	1.15	0.99**	0.03	1.68*	0.13	0.77	0.22	-0.55	0.12	-0.95	-0.56*	0.10	-1.31	-0.25	0.47	-0.37
Apr. 04, 2011	0.71	0.12	1.48	0.84*	0.06	0.95	0.24	0.59	0.81	0.58*	0.09	1.23	0.51	0.14	1.08	0.34	0.33	0.70
Jul. 15, 2011	-0.73	0.11	-1.21	-0.68	0.13	-1.32	-0.40	0.38	-0.24	-1.16***	0.00	-1.84*	-0.43	0.22	-1.21	-1.16***	0.00	-2.00**
	Obs.: 9			**Top 9 CT1 before (b)**												Obs.: 56		
Jan. 13, 2011	1.27***	0.00	1.66	0.63	0.14	0.93	1.15***	0.01	1.80*	-1.45***	0.01	-2.13**	-1.29**	0.02	-1.98**	-0.84	0.11	-1.40
Apr. 04, 2011	1.68***	0.00	2.61**	1.31***	0.00	2.15**	1.13***	0.01	1.92*	0.18	0.73	0.13	0.13	0.81	0.11	0.13	0.81	-0.10
Jul. 15, 2011	0.18	0.66	0.39	-0.32	0.46	-0.57	0.50	0.24	0.78	-0.26	0.61	-0.76	-0.11	0.84	-0.25	-0.26	0.62	-0.66
	Mean equality test: (a) - (b)																	
Jan. 13, 2011	-0.55	0.40		0.36	0.50		-1.02	0.15		0.90***	0.01		0.71***	0.00		0.59	0.11	
Apr. 04, 2011	-0.97	0.21		-0.47	0.47		-0.88	0.20		0.40**	0.05		0.39	0.11		0.21	0.15	
Jul. 15, 2011	-0.91*	0.08		-0.37	0.42		-0.89	0.13		-0.90***	0.01		-0.33	0.18		-0.93**	0.03	

*Note: This table reports the standardized average stock and bond cumulative abnormal returns over the events windows (-2,2), (-2,-1) and (0,2) for the sample of tested banks classified by Bottom 9 and Top 9 CT1 before mitigating measures over three events dates. Grank t is the t-statistic of generalized rank test. January 13, 2011 is the first announcement date of the stress test; April 08, 2011 is the capital definition date; July 15, 2011 is the stress test results publication date. (.) are the p-value.. ***,**,* indicate respectively significant at 1%, 5% and 10%. Obs. is the number of banks in the sample. We report also the mean equality test between the CAR of the two groups.*

Table A13: Stock and bond cumulative abnormal returns (CAR) for the group of tested banks bottom 14 and top 14 CT1 before mitigating measures using *Bond Level Approach* for the calculation of bonds' CAR.

Events dates	Stock									Bond								
	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t	CAR(-2,2)	P-val	G-rank t	CAR(-2,-1)	P-val	G-rank t	CAR(0,2)	P-val	G-rank t
	Obs.: 14			**Bottom 14 CT1 before (a)**												Obs.: 277		
Jan. 13, 2011	1.06***	0.01	1.94*	1.29***	0.00	2.29**	0.32	0.43	0.83	-0.86**	0.02	-2.01**	-0.87***	0.01	-1.95*	-0.41	0.25	-1.30
Apr. 04, 2011	1.13***	0.01	2.11**	1.40***	0.00	1.88*	0.33	0.42	0.99	0.22	0.54	0.38	0.25	0.48	0.48	0.08	0.82	0.07
Jul. 15, 2011	-0.72*	0.08	-1.16	-0.73*	0.07	-1.24	-0.34	0.41	-0.50	-0.84**	0.02	-1.40	-0.45	0.21	-0.99	-0.72**	0.04	-1.28
	Obs.: 14			**Top 14 CT1 before (b)**												Obs.: 258		
Jan. 13, 2011	1.15***	0.00	1.69*	0.82**	0.03	1.17	0.83**	0.03	1.31	-0.88***	0.00	-0.58	-0.97***	0.00	-0.25	-0.35	0.17	-0.81
Apr. 04, 2011	1.59***	0.00	2.78***	1.41***	0.00	2.47**	0.92***	0.01	1.74*	-0.08	0.77	0.66	0.12	0.63	1.10	-0.20	0.44	-0.36
Jul. 15, 2011	0.20	0.59	0.52	-0.31	0.41	-0.66	0.50	0.18	0.98	-0.02	0.94	0.59	0.05	0.86	0.95	-0.06	0.81	-0.06
	Mean equality test: (a) - (b)																	
Jan. 13, 2011	-0.09	0.84		0.47	0.31		-0.51	0.31		0.01	0.95		0.09	0.74		-0.06	0.60	
Apr. 04, 2011	-0.46	0.40		-0.01	0.98		-0.59	0.20		0.29**	0.02		0.13*	0.10		0.28*	0.07	
Jul. 15, 2011	-0.92**	0.03		-0.43	0.26		-0.84**	0.05		-0.82***	0.00		-0.51***	0.00		-0.68***	0.00	

*Note: This table reports the standardized average stock and bond cumulative abnormal returns over the events windows (-2,2), (-2,-1) and (0,2) for the sample of tested banks classified by Bottom 14 and Top 14 CT1 before mitigating measures over three events dates. Grank t is the t-statistic of generalized rank test. January 13, 2011 is the first announcement date of the stress test; April 08, 2011 is the capital definition date; July 15, 2011 is the stress test results publication date. (.) are the p-value.. ***,**,* indicate respectively significant at 1%, 5% and 10%. Obs. is the number of banks in the sample. We report also the mean equality test between the CAR of the two groups.*

CHAPTER 2[15]

Bank opacity and market reaction to regulatory stress tests

[15] This chapter is an article co-authored with Amavi Agbodji titled “Bank opacity and market reaction to regulatory stress tests”.

2.1. Introduction

Stress testing is an important banking supervision tool for supervisory and regulatory authorities. Initially considered as a crisis management tool, stress testing gradually established itself these last years as one of the main banking supervision tools, as well in Europe as in United States (US). Its main objectives are to provide detailed information about banks' financial health and to assess, not only the resilience of the whole banking system, but also the resilience of each participating banking institution to extreme but plausible macroeconomic shocks (stressed scenarios). In other terms, stress tests allow supervisors to estimate the impact of these stressed scenarios on the solvency and the profitability of each participating bank, in order to check if the bank is well capitalized or to impose corrective measures (a plan to increase capital buffers for example) in the opposite case.

In this paper, focusing on the 2011 & 2014 EU-wide stress tests and the 2013 & 2015 Dodd-Franck Act stress tests, we investigate whether investors react differently according to the degree of banks' opacity when information about banks are disclosed on the financial market. Some previous studies (Morgan et al., 2013; Petrella and Resti, 2013; Shuermann, 2014) empirically proved that the disclosure of a stress test results reduces (or mitigates) banking opacity and causes market reactions. But none of these studies have investigated whether the market reaction is different according to the degree of banks' opacity. In other words, none of them have tried to examine whether the investors' reaction is more important (less important) when the bank is more opaque (less opaque). Indeed, we assume that if the opacity of the bank is not important (i.e. most of the information published are already known), there will be little reaction from investors after the disclosure of stress test results. But if the bank is highly opaque and (it is important) if the stress test has actually reduced its opacity, the amount of new information disclosed will make react strongly the market. So, a weak reaction from the market can mean that the stress test has not actually reduced the opacity of the bank (i.e. the information disclosed are not significant and/or relevant enough to reduce the opacity of the bank). Therefore, this study is important because it permits to show if the stress test reach its main objective of reducing opacity of highly opaque banks. Being the first to provide empirical evidence on the link between the market reaction (after the disclosure of stress tests results) and banks' opacity, our paper attempts to contribute to the existing literature on banking stress tests, especially to the literature on the information value of stress tests and the literature on the determinants of market reaction to stress test results' disclosure.

We conduct this work in two stages. First, we analyze reaction of market participants to the stress tests results' disclosure by distinguishing not only tested and non-tested banks, but also banks from Europe and banks from the U.S. Unlike previous studies (Ellahie, 2013; Petrella and Resti, 2013; Morgan et al., 2013; Candelon and Sy, 2015) which used standard event study, we adopt the new event study methodology proposed in Flannery et al. (2015) based on the absolute value of the abnormal returns. This method enables to capture the real intensity of investors' reaction to an information without worry about the direction in which they react. We then apply a standard event study methodology on banks' daily trading volume in order to see if there is an abnormal increase or decrease of the trading volume when information are disclosed. Second, we make a cross-section regression of the cumulative abnormal reactions over an opacity variable and some control variables in order to evaluate the impact of the opacity variable on the cumulative abnormal reactions.

On the one hand, we find that investors react both for the group of tested and non-tested banks meaning that the stress tests bring also some information about non-tested banks, contrary to the conclusions of other studies (Petrella and Resti, 2013, Candelon and Sy, 2015) which found that only information about tested banks are provided by the tests. But globally, the market reaction is higher for tested banks, compared to non-tested banks. We also find that investors' reaction is stronger for banks from Europe than for banks from the U.S., thus suggesting that European banks might be more opaque than U.S. ones before the stress tests results disclosure. On the other hand, when we classify banks into two groups according to their opacity (the less opaque banks' group and the more opaque banks' one), the cross-section regression show that on the sub-sample of less opaque banks, the opacity variable has positive impact on the market reaction. But in the case of more opaque banks sub-sample, this impact is negative. This means that the hypothesis of high market reaction for highly opaque banks after the disclosure of stress tests' results is valid only if we consider the sub-sample of less opaque banks. Hence, these results suggest that even if stress tests bring relevant information, the opacity reducing is mainly for banks whose opacity is not at a high level (not for highly opaque banks).

The rest of the paper is structured as follows: in Section 2, we review the literature on banking opacity and stress tests' information value. Then, Section 3 presents our study sample and describes the methodology. Section 4 reports our empirical findings while Section 5 concludes.

2.2. Literature review

Banks are opaque by nature because of their intermediation function. In fact, the delegation of the borrowers' monitoring to the banks (by lenders) is optimal (from an allocative point of view) (Diamond, 1984), but creates a banking opacity. Effectively, if banks were completely transparent, there should be no market reaction to the release of supervisory information but it is not the case. Indeed, Flannery and Houston (1999) prove that the financial market is aware of banks' examinations and takes into account these examinations when valuing banks' stocks. Jordan et al. (2000) also find that the release of the supervisory information induces substantial movements in stocks prices. These results were confirmed among others by Petrella and Resti (2013), thus proving the fact that banks are opaque. Consequence of this banking opacity, investors are not able to anticipate all relevant information concerning banks' financial health.

Several proxies are used in the literature to measure this banking opacity[16]. One of the main proxies used is the stock price synchronicity "R^2" (which statistically represents the proportion of security return variation that can be explained by movements in market returns). Many authors (Morck et al., 2000; Jin and Myers, 2006; Hutton et al., 2009; Haggard et al., 2008) show that there is a positive relationship between this stock price synchronicity and opacity. In other words, greater transparency and more complete revelation of firm-specific information (lower opacity) is associated with lower R^2 thus suggesting that stock price synchronicity R^2 is an *inverse* proxy for information quality.

This banking opacity is one of the main reasons advanced to justify the banking regulation and supervision in order to protect creditors and depositors (who are in information asymmetry) from the excessive risk taking of banks. Hence, several regulatory and supervisory tools have been put in place like for example deposits insurance, Basel rules etc. Concerning this latter, Berger et al., (1995) show that requiring a minimum capital as a percentage of risk-adjusted assets prevents banks from excessive risks taking. But the fact is that despite these requirements, banking opacity varies substantially through time. In crisis periods (i.e. the 2008 financial crisis), banks' opacity tends to increase (Flannery et al., 2013). Therefore, additional ways are needed to protect and reassure the market in these periods. One of the most important ways are *the stress tests* which are expected to reduce the banking opacity by providing relevant

[16] Coverage via analysts' earnings forecasts taken from IBES (Akhigbe and McNulty, 2013), Split rating (Morgan, 2002), Balance sheet structure (Distinguin et al., 2006).

information to investors on banks' financial health, in hope of restoring their confidence in the soundness of these individual banks and of the banking system as a whole.

In order to investigate the financial market reaction to the disclosure of information brought by stress tests, several studies have been performed. Their main purpose was to check whether the tests actually provided new relevant information to the market on individual banks' situation (and more generally on the banking system situation). The great majority of these studies (including studies which will be discussed in the coming lines) used standard event study methodology.

Ellahie (2013) studies the 2011 EU-Wide stress test and according to its conclusions (supported by empirical evidence), after the disclosure of the 2011 stress test results, information asymmetry declined gradually contrary to information uncertainty which increased significantly. In other words, the stress test allowed to distinguish strong banks and fragile banks (meaning that the test provided new relevant information to the market) but, at the same time, it led to a worsening of uncertainty, worsening which may be due to a deficiency in credibility. Examining also the 2011 European stress test exercise in order to assess whether and how it affected banks' stock prices, Petrella and Resti (2013) show that the test provided new relevant information to market participants and can play a role in mitigating banking opacity. First, they empirically show that the tested banks' cumulative abnormal returns (CAR) is significantly higher than one of the non-tested banks over the (-2, +2) window (+1.5 percent of difference). Second, considering only tested banks, they show that before the publication, there was no statistically significant difference between strong banks' CAR and weak banks' one. But after the publication, statistically significant differences emerged (at the level of several financial indicators) in favor of strong banks consistent with the idea of greater bank opaqueness prior to the disclosure of the stress test results. Candelon and Sy (2015) study both US and EU-wide stress tests, performed from 2009 to 2013. Concerning EU-wide stress tests (and unlike the results of Petrella and Resti (2013)), their results show a significant but negative average CAR after the publication of the 2011 test results (-1.9 percent for stressed banks, -0.8 percent for non-stressed banks). However, they find that the other tests (2010 and 2012 exercises) had a statistically significant positive effects on stressed banks' valuation (significant positive CAR) but no significant effects on non-stressed banks. Concerning US, they find that the 2009 banking stress test (SCAP[17]) had a large statistically significant effects on tested banks

[17] Supervisory Capital Assessment Program.

(+10.7 percent of average CAR), but no significant effects on non-tested banks. The other ones (2012 and 2013 exercises) effects on tested banks decreased over time (+3 percent in 2012 and -0.6 percent in 2013) but there are still no significant effects on non-tested banks. Furthermore, authors also argue that the qualitative aspects of the governance of stress tests can be key determinants of success, and that most technical issues are relatively less important.

Other studies are also interested in US banking stress tests in order to evaluate their publication effects. Indeed, Morgan et al. (2013) also investigate the market reaction after the 2009 banking stress test conducted by the FED. According to their conclusion, first the test actually provided information to the market. More precisely, they argue that long time before the stress test, investors had already identified the banks that have a capital deficiency but what they did not know was the exact amount of their need for capital. Hence, at the disclosure of these amounts, investors were "surprised" conducting them to re-valuate banks' stock prices because of the new relevant information. Second, authors find that banks whose capital needs are higher than the market estimates saw their abnormal returns negatively impacted (lower abnormal returns), in contrast to strong banks (whose capital needs are lower or equal to the market estimates). Glasserman and Tangirala (2015) was interested in the predictability across time of FED's stress tests results. First, comparing projected losses across the two scenarios used in the 2014 DFAST, they highlighted a nearly perfect linear relationship between these losses. Second, considering the 18 banks which participated in stress tests from 2012 to 2014, they examined the relationship between the projected losses S_T and S_{T-1} from stress tests run in years T and T − 1, respectively. The results show that losses by bank and loan category are highly persistent (correlated) from one year to the next (the correlations are 0.96 from 2012 to 2013 and 0.97 from 2013 to 2014). Based on these findings, they conclude that the stress tests have become more predictable and thus less informative over time.

Then, highlighting the fact that previous studies which analyze the market reactions to stress test announcements found mixed evidence (example of Petrella and Resti (2013) and Candelon and Sy (2015) who found opposite results concerning the 2011 EU-Wide stress test), Flannery et al. (2015) argue that this situation is due to inappropriate assumptions embedded in standard event study methodology (which was used in these previous studies)[18]. For these authors, a

[18] Flannery and al., (2015) noted two example:

- The standard event study methodology assumes that all treated firms react in the same direction, so a zero mean abnormal return implies no effect on treated firms. But a mean return for stress-tested banks could be zero for two quite different reasons. Either the abnormal return is very small for all firms, or the returns are large in absolute value, but positive for some BHCs and negative for others.

standard event study does not necessarily tell us what we need to know about new information produced in stress tests. To address this conceptual shortcoming, Flannery et al. (2015) examine three additional measures. The first and most important one is the "*absolute cumulative abnormal returns* (|*CAR*|)" which should better capture disparate, but significant changes in stock price. The second is the "*cumulative abnormal trading volume* (*CAV*)" and the last is the abnormal change in CDS spreads. Using these additional measures, authors studied the information value of the Federal Reserve stress tests (SCAP, CCAR and DFAST) from 2009 to 2015. According to their conclusion, not only these tests produce information about stress-tested firms, but also about non-stress-tested banking companies (three percent of |CAR| for tested banks and two percent for non-tested banks). Furthermore, Cumulative abnormal trading volumes are 132 basis points (bps) higher than volumes predicted by a market model (for tested banks) and 14 bps for non-tested banks. They also conclude that absolute value abnormal returns and trading volumes are higher for more levered and riskier firms and that there is no evidence of negative welfare costs associated with the disclosure of stress test results, unlike to the theory defended by Goldstein and Sapra (2014).

Using Flannery et al. (2015) additional measures (the |*CAR*| and the CAV), we study the information value of both Europe and the U.S. supervisory stress tests (the 2011 & 2014 EU-wide stress test, and the 2013 & 2015 DFA stress test). Furthermore, we estimate some cross-section models to determine whether the market reaction is different according to banks' opacity degree.

2.3. Sample, variables and methodology

In this section, we present respectively the sample on which the study is based, the methodology (including the set of variables) and the research design.

2.3.1. Sample description

In order to perform our investigations on the financial market response to stress tests' results announcements, we only consider publicly traded banks (i.e. listed on a stock exchange) because our study requires the use of daily data on banks' stock prices.

- Because stress test announcement dates are known well in advance, their information content for each firm must be evaluated in relation to the market's prior beliefs about that firm's condition. By contrast, standard event study methodology assumes that the events are unanticipated, making market expectations zero by definition. Large negative or positive announcement effects are both consistent with the stress test results conveying new information to the market.

Consequently, we collect stocks daily prices and daily trading volumes from Bloomberg database for European and American banks. In the case of European banks, we find from Bloomberg 238 banks which are traded on stock market. Nevertheless, some banks' stock prices are not available or the stocks are not traded on regular time. After cleaning for these banks, the remaining sample contained 167 banks with regular quoted price. As we study the financial market reaction to two stress tests, we require that each bank in the sample gets stock price on the period of both stress tests. Some banks in the sample that have prices around 2014 stress test period for example, are not quoted when we consider the 2011 stress test period and vice versa. When we consider only banks having regular prices on the two stress tests, our final sample of European banks consists of 156 banks, including 49 tested banks for the 2014 exercise and 42 tested banks for the 2011 one[19]. Furthermore, these 156 banks operate in 22 different European countries[20].

Concerning US banks, we apply the same selection procedure than in the case of European banks. We go from the original sample of 1134 banks to the final sample of 545 banks including 23 tested banks. Finding that the number of non-tested banks is too huge compared to the number of tested banks, we consider only the 100 largest U.S. banks (among the 545 banks available) in term of market capitalization at the end of the first quarter of 2014 (2014: Q1). This allows to balance the number of tested banks compared to the one of non-tested banks. In these 100 considered banks, 17 participated to the 2013 stress test and 23 to the 2015 one[21]. 97% of these banks are listed "Bank Holding & Holding Companies" and the remaining are Commercial banks.

For each bank, we consider the daily stock price data (stock trading volume data) and the daily country-specific stock market price data (stock market trading volume data). Then, to investigate whether the market reacts differently according the degree of opacity of banks, we had to collect annual accounting data (of our sample of banks) from Bankscope Fitch IBCA.

[19] In total, 90 banks participated to the 2011 EU-wide stress test and 123 to the 2014 exercise.

[20] Austria(3), Belgium(4), Britain(5), Cyprus(1), Denmark(20), Faroe Islands(1), Finland(2), France(17), Germany(7), Greece(6), Hungary(1), Ireland(3), Italy(17), Liechtenstein(2), Malta(2), Netherlands(2), Norway(21), Poland(10), Portugal(2), Spain(6), Sweden(4), Switzerland(20).

[21] In United States, a total of 18 banks participated to the 2013 stress test when 31 participated to the 2015 one.

2.3.2. Methodology

The study is conducted in two stages: first, we investigate the market reaction to the disclosure of stress tests' results; second, using a cross-sectional model, we analyze whether the market reacts differently according the degree of banks' opacity.

2.3.2.1. Event study description

To capture the financial markets' reaction to the announcements of stress tests' results, we use the new event study methodology proposed in Flannery et al. (2015). As "events", we consider the results' release dates of stress tests conducted in 2011 and 2014 by the EBA and the ECB in the case of European banks, and for U.S. banks, the results' release dates of stress tests conducted by the Federal Reserve in 2013 and 2015 are considered. Table 1 reports all these results' release dates.

Table 1: EU-wide and US stress tests' disclosure dates.

Area	Exercise	Disclosure dates
European Union	2011 EBA stress test	July 15, 2011
	2014 EBA-ECB stress test	October 26, 2014
United States	2013 DFA stress test	March 7, 2013
	2015 DFA stress test	March 5, 2015

Sources: European Banking Authority and U.S. Federal Reserve.

The standard event study generally tests if the abnormal returns are significantly different from zero on the date of event. This test makes implicitly the hypothesis that markets participants have any information (any expected) before the event. But in the case of stress test, some information about the stress test exercise are provided by regulators long time before the results disclosure. In addition, analysts also can do their own analysis to get vision on the future results of the stress test. On the other hand, the abnormal returns could be zero not only because of the absence of new relevant information brought by the event, but also because the returns are small or because that some abnormal returns are positive and some others are negative in the group of banks. All these elements make difficult the detection of significant mean abnormal returns (Flannery et al., 2015). This also could explain the fact that many previous studies failed to find abnormal returns on the date of stress test results' release, or the fact that many others found mixed evidence.

In this study, we therefore follow Flannery et al. (2015) by supposing that market participants have already some expectations about the stress test results. In addition, to eliminate the problem of negative or positive abnormal returns in the mean (of abnormal returns), we use the absolute abnormal return. In this way, the fact that investors react in the positive or negative direction is not relevant.

Hence, we measure the stock market reaction by the absolute Cumulative Abnormal Returns |CAR|. The |CAR| is obtained by computing first the absolute abnormal return $|AR_{it}|$ for bank i at time t which is the absolute value of the difference between the observed stock return R_{it} and the expected (normal) return $\hat{R}_{it}$ generated by a market model.

$$|AR_{i,t}| = |R_{i,t} - \hat{R}_{i,t}| \quad (1)$$

The normal return is defined as the return that would be expected if the event did not take place. To determine it, we estimate the market model (using daily returns) over a *200 trading days window* (consistent with Weston et al. (2004) suggestion and previous research).

The market model: $$R_{i,t} = \alpha_i + \beta_i . R_{m(i),t} + \varepsilon_{i,t} \quad (2)$$

The estimated model: $$\hat{R}_{i,t} = \hat{\alpha} + \hat{\beta}(R_{m(i),t}) \quad (3)$$

With:

$$R_{i,t} = \log\left(\frac{P_{i,t}}{P_{i,t-1}}\right) \quad (4)$$

$$R_{m(i),t} = \log\left(\frac{P_{m(i),t}}{P_{m(i),t-1}}\right) \quad (5)$$

Where:

$R_{i,t}$ is the daily stock return of bank i, on day t and $R_{m(i),t}$ the daily country-specific market return of bank i's country, on day t. $P_{i,t}$ is the daily stock price of bank i, on day t when $P_{m(i),t}$ is the daily country-specific market price of bank i's country, on day t.

The 200-day window goes from t-230 to t-31[22], where t is the event date to be tested.

[22] Consistent with Petrella and Resti (2013).

Then, for each bank i, we get the absolute cumulative abnormal return ($|CAR_i|$) by summing the absolute abnormal returns over a relevant window around the event date (t). Following Petrella and Resti (2013) and Candelon and Sy (2015), we focus on a *five-day event window* including 2 days before the event day and 2 days after the event (t-2, t+2). According to Petrella and Resti (2013), this is generally enough to be applied across all announcements without tampering with individual dates, as it incorporates both the risk of a news leak before the announcement and the possibility that investors react slowly as the implications of the news are properly digested. In addition, we also compute the ($|CAR_i|$) on the event window (t-2, t-1) and (t, t+2) in order to decompose and get a clearer vision of the whole event window.

Finally, we calculate the average absolute cumulative abnormal return for each group (i.e. the group of tested banks, the group of non-tested banks and the group of all banks).

Average |CAR| is calculated as:

$$\text{Average } \left|\text{CAR}\right| = \frac{\sum_{i=1}^{N} |\text{CARi}|}{N} \tag{6}$$

Where N is the number of banks in the considered group.

To test the significance of the average |CAR|, we cannot use the standard event study test statistics because it null hypothesis is that abnormal returns are equal to zero while in our case, we are sure that the average |CAR| is positive (insofar as each bank |CARi| is positive).

So, for each test, we assess the significance of average |CAR| during the event windows by comparing it to the average |CAR| over the pre-event period (estimation period)[23]. Indeed, if the results released in the stress test are different from the markets' expectations, the reactions of investors on the event date would be significantly different from their reactions before the event (during the estimation period).

To evaluate whether an average |CAR| (on an event window) differs significantly from its pre-event value, we use two different statistic tests:

- The first one is a basic ***T-test*** of the difference in means between the event |CAR| and the pre-event values.

[23] The average value of |CAR| over the estimation period is computed as: the sum of the $|AR_i|$ during the estimation period (200 days), divided by 200 multiplied by "*X*" for the "*X*" days event window. $X \in \{2; 3; 5\}$.

- The second statistic test is the ***Wilcoxon rank sum test***. This test is a non-parametric test and, unlike the t-test, does not required the underlying populations to be normally distributed.

According to Karpoff (1986), informational events affect trading volume. In other words, trading volume can increase if the information published are relevant for investors (i.e. different from their prior expectations). So, like |CAR|, and for each group, we try to measure (in percentage[24]) the average cumulative abnormal trading volume over the different event windows.

Therefore, we compute the abnormal trading volume (AV_{it}) for bank i at time t which is the difference between the observed trading volume V_{it} and the expected trading volume $E(V_i)$, given market-wide trading volume, all them normalized by shares outstanding.

$$AV_{it} = V_{it} - E(V_i) \tag{7}$$

To obtain the expected trading volume, we regress each bank's daily trading volume on daily market trading volume[25]:

The model: $$Vol_{i,t} = \alpha_0 + \alpha_1 Vol_{Market,t} + \varepsilon_{i,t} \tag{8}$$

The estimated model: $$\widehat{Vol}_{i,t} = \hat{\alpha}_0 + \hat{\alpha}_1 Vol_{Market,t} \tag{9}$$

With:

$\boldsymbol{Vol_{i,t}}$: Number of shares traded by bank i, on day t divided by the number of shares outstanding on the same day.

$\boldsymbol{Vol_{Market,t}}$: Total number of shares traded in the Index on day t divided by the number of shares outstanding in the index on the same day.

The model is estimated (using daily data) over a 200 trading day window which goes from t-230 to t-31, where t is the event date to be tested.

Then, for each bank i, we compute the Cumulative abnormal trading volume (CAVi) which is the sum of abnormal trading volume over the five-day event window (t-2, t+2). Here also, we compute the CAVi on the event window (t-2, t-1) and (t, t+2).

[24] Volumes are normalized by shares outstanding.

[25] Here also, we use country-specific market volumes.

Finally, for each group, we sum the CAVi and divide the result by the number of banks in the group. As we test that if the trading CAVi is significantly different from zero, we consider the statistic developed by Patell (1976). The statistic is adjusted by Kolari and Pynnonen (2010) in order to handle clustering problems. Thus, we use the adjusted statistics:

$$t_{AP} = \frac{\overline{SCAV}\sqrt{N}}{\sqrt{(L_{est}-2)/(L_{est}-4)}\sqrt{1+(N-1)\bar{r}}} \quad (10)$$

With:

$\overline{SCAV}$: is the average standardized cumulative abnormal volume.

N : is the number of banks

L_{est} : is the length of the estimation period.

$\bar{r}$: is the average cross-correlation of the estimation period residuals.

1.1.1. Cross-section model

To investigate whether the financial market reacts differently according the degree of opacity of banks, we estimate the following model:

$$|CAR|_{i,t} \text{ or } SCAV_{i,t} = \alpha + \beta \times SYNC_{i,t} + \gamma(\text{Bank characteristics}_{i,t}) + \varepsilon_{i,t} \quad (11)$$

From Eq.(11), "$SYNC_{i,t}$" is the stock price synchronicity of bank i at time t and "Bank $characteristics_{i,t}$" is a set of observable characteristics of bank i at time t.

To examine empirically whether the financial market reacts differently according the degree of banks' opacity, we consider as an opacity measure the stock price synchronicity "R^2" where R^2 is the coefficient of determination from the same market model regression presented in Eq.2: $R_{i,t} = \alpha_i + \beta_i.R_{m(i),t} + \varepsilon_{i,t}$. Indeed, greater transparency and more complete revelation of firm-specific information (lower opacity) is associated with lower R^2.

However, because R^2 is bounded within the interval [0, 1], we follow Morck, Yeung, and Yu (2000), Piotroski and Roulstone (2004), Xing and Anderson (2010) and Soedarmono and Tarazi (2013) by applying to it a logistic transformation. Hence, as opacity measure we will use the variable:

$$\text{SYNC} = \log\left(\frac{R^2}{1-R^2}\right) \quad (12)$$

We also want to make two clarifications here: first, we estimate the market model (from which we compute the R^2) using a 1-year rolling windows from t-1, t being the event date to be tested; second, concerning the daily market return ($R_{m(i),t}$), we no longer considered a country-specific stock market index but a bank index. By doing this, we measure the bank opacity basis on a banking sector index. Therefore, for the Euro Area, we consider the EURO STOXX Banks Price EUR index (SX7E Index) and for the U.S., we consider the Dow Jones US Total Market Banks Index (DJUSBK Index).

2.3.2.2. Summary statistics

Table 2 shows the detailed descriptive statistics of all variables and for the full sample. Some of these variables showed highly skewed and heavy tails distribution, thus suggesting the presence of outliers. To manage this issue, instead of drop the observations identified as outliers, we rather winsorize these variables at particular percentiles (the extreme values are replaced by specified percentiles)[26].

In Table 3, we present the pairwise correlations among regressors. As we can see, the correlations between some regressors are close to 0.5 or 0.6 but it will not cause us problems because we ensure that multicollinearity issues are kept under control. This is confirmed by the Variance Inflation Factors (VIFs) analysis (Liao and Valliant, 2012; Miles, 2014) presented in Table 4.

[26] We winsorize each non-normal variable separately, by choosing the best percentiles for each of them.

Table 2: Definition of all variables and descriptive statistics of the full sample.

Variables	Obs.	Definition	Mean	Std. Dev.	Min	Max
|CAR|	480	Absolute Cumulative Abnormal Returns	0.0492	0.0284	0.0131	0.119
SCAV	480	Standardized Cumulative Abnormal Volume	0.000444	0.006521	-0.011402	0.017288
SYNC	480	Bank Stock Price Synchronicity	-0.756	1.149	-4.150	0.725
CI	450	Ratio of Cost to Income (%)	60.98	13.43	22.12	127.5
ROAA	452	Return On Average Assets (%)	0.683	0.541	-0.800	1.970
NIM	452	Net Interest Margin (%)	2.526	1.239	0.520	6.140
LIQ	450	Ratio of Liquid Assets to Customer And Short Term Funds (%)	20.96	21.40	1.840	93.83
EQNL	450	Ratio of Equity To Net Loans (%)	16.33	7.210	7.590	35.11
PBV	431	Ratio of Price To Book Value - close	1.010	0.554	0.0400	2.670
NPL	402	Ratio of Impaired Loans (NPLs) to Gross Loans (%)	3.928	3.918	0.370	14.60
TOTRISK	480	Stock Total Risk	0.000304	0.000193	7.53e-05	0.000791
DENS	313	Ratio of RWA To Total Assets (RWA density ratio)	7.363	1.993	3.842	12.41

Sources: Authors' calculation.

Table 3: Pairwise correlations among regressors.

	SYNC	CI	ROAA	NIM	LIQ	EQNL	PBV	NPL	GRISK	LEV
SYNC	1									
CI	0.1314	1								
ROAA	0.1429	-0.4579	1							
NIM	0.0928	-0.0963	0.3856	1						
LIQ	0.0495	0.2365	-0.3057	-0.4309	1					
EQNL	0.2462	0.1577	0.3060	0.2245	0.2390	1				
PBV	0.2377	-0.1290	0.5128	0.2552	-0.0915	0.2079	1			
NPL	-0.0994	0.0252	-0.4292	0.0740	0.1434	-0.1405	-0.2660	1		
TOTRISK	0.0892	0.2276	-0.4170	0.0665	0.1243	-0.0884	-0.2517	0.5280	1	
DENS	-0.0115	-0.0628	-0.3466	-0.0794	-0.1682	-0.6079	-0.2658	0.2014	0.3326	1

Sources: Authors' calculation.

Note: SYNC is the bank stock price synchronicity. CI is the ratio of cost to income. ROAA is the returns on average assets. NIM is the net interest margin. LIQ is the ratio of liquid assets to customer and short term funds. EQNL is the ratio of equity to net loans. PBV is the ratio of price to book value. NPL is the ratio of impaired loans to gross loans. TOTRISK is the stock total risk. DENS is the ratio of risk weighted assets to total assets.

Table 4: Collinearity Diagnostics

Variable	VIF	SQRT VIF	Tolerance	R-Squared
SYNC	1.17	1.08	0.8567	0.1433
CI	1.69	1.30	0.5905	0.4095
ROAA	3.71	1.93	0.2696	0.7304
NIM	1.87	1.37	0.5358	0.4642
LIQ	1.72	1.31	0.5813	0.4187
EQNL	2.62	1.62	0.3824	0.6176
PBV	1.70	1.30	0.5898	0.4102
NPL	1.82	1.35	0.5491	0.4509
TOTRISK	1.93	1.39	0.5183	0.4817
DENS	1.89	1.37	0.5291	0.4709
Mean VIF	2.01			

Sources: Authors' calculation.

Note: SYNC is the bank stock price synchronicity. CI is the ratio of cost to income. ROAA is the returns on average assets. NIM is the net interest margin. LIQ is the ratio of liquid assets to customer and short term funds. EQNL is the ratio of equity to net loans. PBV is the ratio of price to book value. NPL is the ratio of impaired loans to gross loans. TOTRISK is the stock total risk. DENS is the ratio of risk weighted assets to total assets.

2.4. Empirical results

In this section, we study whether the financial market reaction to banking stress test information differs according to the opacity level of banks. As we conduct this study on two stages, we first present the market participants' reactions to the different stress test results' disclosure. Secondly, we estimate different linear regressions of individual bank's |CAR| and SCAV on the chosen opacity variable and some control variables.

2.4.1. Financial market's response to the stress tests announcements

Table 5 presents stock market reactions to stress tests results' disclosure for Europe and U.S. banks. In the case of European banks, the pre-results window ((-2, -1)) shows that the average |CAR| is not significantly different from its pre-event values (the average |CAR| estimated over the estimation window) both for the 2011 and 2014 stress test, either for tested banks' group or non-tested banks' one. However, when we consider the results window ((0, +2)) we find significant reactions. Indeed, either in 2011 or 2014, not only the group of tested banks show a significant increase in its average |CAR| (compared to the pre-event values), but also the group of non-tested banks. Nevertheless, the increase at the level of tested banks' group is generally stronger, meaning that investors' reaction is higher for these banks than for non-tested banks.

Indeed, in 2011, considering the tested banks' group, the variation in average |CAR| increases from a non-significant -10 bps (before the disclosure) to 200 bps, significant at 1% level. Considering the non-tested banks' group, this variation increases from 20 bps (also non-significant) to 90 bps, significant at 5% level. The same situation could be observed during the next exercise (in 2014) where tested banks and non-tested banks show respectively, a variation of 160 and 70 bps (all significant at 5% level) on the results disclosure window while before the disclosure, the two group of banks show non-significant abnormal reactions. Considering the overall sample of banks, the variation in average |CAR| increases from a non-significant 10 bps (before the disclosure) to a significant 120 bps (at 1% level) after the disclosure in 2011 while in 2014 it increases from a non-significant 20 bps to a significant 100 bps (significant at 1% level also). Over the entire window (-2, +2), the variation in average |CAR| is almost the same for the two stress tests exercises (130 bps), but the 2011 one is more significant (1% level) than the one of 2014 (5% level), thus suggesting that for the two stress tests, the market reaction after the disclosure outperforms the market reaction before the disclosure. These findings show that the two European Union wide stress tests provided new relevant information to financial markets, not only about tested banks' situation, but also about non-tested banks' situation. Furthermore, we remark that the reactions are higher in 2011 than in 2014. Indeed, the year 2011 was a period during which Europe faced to the sovereign debt crisis and a great uncertainty about banks' financial health was in mind of financial markets' participants. The conduct of the stress test brought some clarifications about banks' risk exposure and reassure investors. In 2014, although the sovereign debt crisis was passed, significant reaction is found showing that stress tests also have their interest in calm period.

In one hand, these results show that in Europe, markets are not able to anticipate stress tests' output, thus highlighting the idea of greater banks' opaqueness prior to the results' disclosure. This is proved by the sudden significant reaction of the market when it receives the new information about banks' situation. We therefore argue that these two EU-wide exercises have weakened banks' opacity.

On the other hand, we also argue that EU-wide stress tests provided information about the whole banking system, in contrary to the conclusions of other studies (Petrella and Resti, 2013, Candelon and Sy, 2015) which find that only information about stress tested banks are provided by the tests. So, the European stress tests decrease the opacity of the whole banking system, not only the tested banks' opacity. These results are consistent with Flannery et al. (2015) findings.

In United States, the results found is different from those found in Europe. Indeed, in 2013, considering the tested banks' group, we did not identify any significant change in average |CAR|, whatever the window. For the non-tested banks' group, when we consider the window prior to the results disclosure date, the variation in average |CAR| is not significant while it experienced a significant decrease of 40 bps on the window of the results disclosure. A similar result is found on the sample of the overall banks. In 2015, the variation in average |CAR| has evolved from a non-significant -10 bps to a significant 130 bps after the disclosure (1% level) for the tested banks' group. This strong market reaction is confirmed by the significant variation of 120 bps (also at 1% level) obtained if we consider the entire event window (-2, +2). However, concerning the non-tested banks, the variation in average |CAR| is significant not only after the disclosure, but also before. Indeed, it evolved from a significant -60 bps to a significant 90 bps (both at a 1% level). Considering the overall banks sample, we identified significant variation, whatever the window.

Based on these empirical results, we deduct that the financial market participants have anticipated the 2013 DFAST's results, thus explaining the absence of reactions on the results disclosure date for tested banks. Nevertheless, we observe some information revelation about non-tested banks; this could be explained by the fact that the information disclosed by the stress test could reveal that these banks have some connections with tested banks in interbank market for example. Hence, the information disclosed by the stress test (on tested banks) could affect the non-tested banks. In sum, we argue that the 2013 exercise did not provide new relevant information to the market about the tested banks' situation. We therefore assume that these information provided by the test were (at least partially) already valued in markets prices.

The 2015 exercise was more informative, either for tested banks or for non-tested banks. It provided new relevant information to investors about the 100 considered US banks' situation, thus generating a significant reaction from the market (reaction reflected by the substantial increases in abnormal returns). We therefore argue that in US, markets were not able to anticipate the 2015 stress test results, thus highlighting the fact that before the disclosure, banks might be more opaque. This conclusion is sustained by the sudden significant reaction of the US market when it receives the new information about banks' situation. We therefore argue that unlike the 2013 exercise, the 2015 DFAST has reduced all the banking system opacity. Indeed, it reduced not only the tested banks' opacity, but also the non-tested banks' one.

Comparing these different findings (E.U. & U.S.), we conclude that US banking system appear to be less opaque than European banking system. In other words, globally, the market was less

"surprised" after the tests results' disclosures in the U.S. than in Europe. Indeed, in US, only the 2015 DFAST provided new relevant information to the market whereas in Europe, the two tests provided relevant information. On another side (and it is important to highlight it), the amplitude of market reactions is generally more important in Europe than in US thus suggesting that US investors might be more informed on banks' financial health than European ones. For example, considering overall US banks over the entire window, when in 2013 we did not identify any significant reaction from the market, in 2015 we detect a significant increase (50 bps) in abnormal returns. In Europe, the market reaction is more remarkable. Considering also the overall sample of banks over the entire window, each of the two tests generates a strong and significant reaction from the market (around 130 bps) meaning the fact that European banking system might be more opaque than US banking system. The high reaction of European financial markets could mean also that the need of information is higher in Europe than in the U.S. It could express also the fact European stress tests bring more detailed information to the financial market than US ones.

Table 5: European and US Banks' stock market reaction to the Europe and US stress tests

				|CAR| (-2,+2)			*|CAR| (-2,-1)*			*|CAR| (0,+2)*		
		Group of banks	*#Obs*	*Diff.*	*T-test*	*Wil.-test*	*Diff.*	*T-test*	*Wil.-test*	*Diff.*	*T-test*	*Wil.-Test*
EUROPE	2011	*All*	156	**0.013**	**0.006**	**0.065**	0.001	0.493	**0.064**	**0.012**	**0.001**	**0.031**
		Tested group	42	**0.019**	**0.010**	**0.012**	-0.001	0.728	0.162	**0.020**	**0.000**	**0.000**
		Non- Tested group	114	**0.011**	**0.066**	0.483	0.002	0.379	0.138	**0.009**	**0.033**	0.677
	2014	*All*	156	**0.012**	**0.016**	**0.045**	0.002	0.241	0.379	**0.010**	**0.004**	**0.065**
		Tested group	49	0.021	0.107	0.112	0.005	0.361	0.644	**0.016**	**0.055**	**0.039**
		Non- Tested group	107	**0.008**	**0.046**	0.189	0.001	0.447	0.534	**0.007**	**0.027**	0.450
USA	2013	*All*	100	-0.004	0.129	**0.000**	-0.000	0.911	**0.003**	**-0.004**	**0.012**	**0.000**
		Tested group	17	0.003	0.599	0.890	0.003	0.261	0.705	-0.000	0.919	0.558
		Non- Tested group	83	**-0.005**	**0.062**	**0.000**	-0.001	0.581	**0.001**	**-0.004**	**0.006**	**0.000**
	2015	*All*	100	**0.005**	**0.009**	**0.052**	**-0.005**	**0.000**	**0.000**	**0.010**	**0.000**	**0.000**
		Tested group	23	**0.012**	**0.000**	**0.000**	-0.001	0.628	0.135	**0.013**	**0.000**	**0.000**
		Non- Tested group	77	0.002	0.231	0.767	**-0.006**	**0.000**	**0.000**	**0.009**	**0.000**	**0.000**

Sources: Authors' calculation.

Note: This table reports the different groups of banks, the number of observations, the difference (Diff.) between the average |CAR| (estimated over the event windows (-2, +2), (-2, -1) and (0, +2)) and the average |CAR| estimated over the pre-event period. Because we cannot use the standard event study statistic tests to check whether an average |CAR| is significant or not during an event window, we therefore judged of this significance by assessing whether the average |CAR| over the event window differs significantly from the average |CAR| over the pre-event period. Hence, Diff. is the difference between these two average |CAR| and to evaluate its significance, we use two different statistic tests. The first one is a basic T-test (which is a parametric test) and the second statistic test is the Wilcoxon rank sum test (Wil.-test) which is a non-parametric test; it is their p-values which are reported in this table.

In the same way that stock prices react to new information, according to Karpoff (1986), trading volume also can change if the information published are relevant for investors (i.e. different from their prior expectations). Hence, we also try to identify whether there are abnormal and

significant changes in trading volumes after the stress tests' results disclosure (in order to support our above findings). Results are presented in Table 6.

It stands out from our results that changes in abnormal trading volumes are much less intense than changes in abnormal stocks returns.

In Europe, the 2011 stress test exercise shows that only tested banks' group presents a significant increase in abnormal volumes. Considering banks as a whole, we did not find significant abnormal trading volumes. In 2014, after the results disclosure, the non-tested banks group experienced a significant decrease in abnormal trading volumes while the tested banks benefit a positive trading volume.

Hence we can conclude that these outcomes just partially confirm our above results related to |CAR|: the 2011 and 2014 EU-wide stress tests actually provided new relevant information to investors concerning not only the tested banks' situation, but also the non-tested banks' situation thus generating significant changes in trading volume, either at the level of these two groups (2014), or at the level of one group (2011).

In US, for the two DFAST, there is no significant abnormal trading volume (non-significant average SCAV) before the disclosure, either for tested banks or non-tested banks. But after the disclosure, we find significant abnormal trading volumes. Indeed, for the 2015 DFAST, we find a significant increase in tested banks' group average SCAV after the stress test results disclosure. At the same time, non-tested banks group also experience a significant change in its abnormal volume, but in the inverse direction. These results are a confirmation of our previous findings concerning the 2015 DFAST because significant |CAR| are also found both for tested and non-tested banks. In 2013, considering the tested banks, the average SCAV is not significant whatever the window considered. The same results is found in case of stock prices' abnormal reactions. When we consider the non-tested banks, the abnormal trading volume is significant thus supporting the significant abnormal stock price reaction found previously.

The results found show that the stress test news impact not only the stock prices, but also the trading volumes; it is consistent with the literature's findings.

Table 6: European and US Banks' abnormal trading volume change due to Europe and US stress tests.

		Group of banks	#Obs	SCAV(-2,+2) Avg.	SCAV(-2,+2) T-Patell	SCAV(-2,-1) Avg.	SCAV(-2,-1) T-Patell	SCAV(0,+2) Avg.	SCAV(0,+2) T-Patell
EUROPE	2011	*All*	156	0.11	0.26	0.02	0.85	0.13	0.19
		Tested group	42	**0.67*** **	0.00	**0.42** **	0.03	**0.53*** **	0.01
		Non- Tested group	114	-0.10	0.36	-0.13	0.23	-0.02	0.83
	2014	*All*	156	-0.18	0.13	**-0.20***	0.09	-0.08	0.53
		Tested group	49	**0.54*** **	0.01	0.11	0.61	**0.61*** **	0.01
		Non- Tested group	107	**-0.52*** **	0.00	**-0.34*** **	0.01	**-0.39*** **	0.00
USA	2013	*All*	100	**1.24*** **	0.00	0.20	0.39	**1.45*** **	0.00
		Tested group	17	0.41	0.35	0.45	0.30	0.17	0.70
		Non- Tested group	83	**1.41*** **	0.00	0.14	0.56	**1.71*** **	0.00
	2015	*All*	100	-0.19	0.39	-0.14	0.54	-0.14	0.54
		Tested group	23	0.55	0.21	-0.15	0.73	**0.83***	0.06
		Non- Tested group	77	**-0.41***	0.10	-0.13	0.60	**-0.43***	0.09

Sources: Authors' calculation.

Note: This table reports the different groups of banks, the number of observations, the average standardized cumulative abnormal volume (SCAV) estimated over the event windows (-2, +2), (-2, -1) and (0, +2). Then, in order to evaluate whether an average SCAV is significantly different from zero, we consider the statistic developed by Patell (1976) and adjusted by Kolari and Pynnonen (2010). This table reports therefore, for each event window and for each group, the p-value of this test. *, **, *** indicate respectively significance at 10%, 5% and 1% levels.

These financial markets' reactions show that stress tests announcements bring relevant information to market participants. To investigate if their reactions are different according to banks' opacity level, we proceed to a cross-section regression of the markets' reactions.

2.4.2. Markets' reactions and banks' opacity

Do investors' reactions to stress tests' announcements differ according to banks' opacity level? We try to respond to this question by estimating the |CAR| and SCAV basis on the five days event window ((-2, +2)) over opacity and some control variables. As we want to know the effect of the opacity level on the financial market reactions, we did the linear regression on different sample according to the degree of banks' opacity. We conduct first an estimation on the whole sample, then on the sample of less opaque banks and finally on the sample of more opaque banks. We distinguish less and more opaque banks basing on the values of the variable SYNC related to the 2011 stress test (for Europe banks) and the 2013 stress test (for US banks). Considering the resulting median value of SYNC, the banks whose SYNC value is inferior to the median value (i.e. -0.1521) are considered as the less opaque banks and inversely, the banks whose SYNC value is higher than the median value are considered as the more opaque banks. The regression results are presented in Table 7.

Considering the whole sample estimation in Table 7, the SYNC effect on |CAR| is not significant while we find a significant and positive coefficient effect for SCAV. This positive and significant effect on SCAV means that during the stress test results disclosure, the trading volume of a bank increase with its opacity. The differentiation between the less opaque and more opaque banks gives non-significant effect of SYNC on SCAV for the two groups of banks meaning that the increase in the trading volume is not related to the degree of banks' opacity. Whatever the opacity degree (less opaque or more opaque), the bank benefitted from a positive effect on the trading volume. Furthermore, we remark that the adjusted R^2 of the SCAV models are very low compared to the one of |CAR| models meaning that the |CAR| are more susceptible to capture the banks' characteristics effect in explaining markets' reactions.

Table 7: Linear regression of market's reactions over opacity and control variables.

	|CAR|			*SCAV*		
	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*
Variables	**All banks**	**Less opaque**	**More opaque**	**All banks**	**Less opaque**	**More opaque**
Opacity						
SYNC	-0.000682	0.00601**	-0.0206***	0.00143***	0.000288	0.00115
	(0.00158)	(0.00235)	(0.00767)	(0.000345)	(0.000555)	(0.00285)
Liquidity						
LIQ	0.000170**	0.000363**	8.04e-05	6.07e-06	3.43e-05	-2.89e-05
	(8.37e-05)	(0.000181)	(0.000104)	(2.82e-05)	(3.57e-05)	(4.09e-05)
NPL	0.00172***	0.00140**	0.00181***	0.000121	-2.53e-05	0.000245
	(0.000446)	(0.000578)	(0.000642)	(0.000124)	(0.000140)	(0.000268)
Efficiency						
CI	0.000532***	0.000696***	0.000380*	-1.76e-05	1.35e-05	-2.69e-05
	(0.000150)	(0.000204)	(0.000214)	(3.98e-05)	(2.92e-05)	(8.20e-05)
ROAA	0.0124**	0.0261***	0.0118**	0.00171	0.00186	0.00215
	(0.00487)	(0.00677)	(0.00482)	(0.00131)	(0.00120)	(0.00236)
NIM	-0.00315**	-0.00117	-0.00511**	-0.000566	0.000474	-0.00173**
	(0.00150)	(0.00207)	(0.00203)	(0.000471)	(0.000649)	(0.000823)
PBV	-0.00267	-0.0119***	-0.00669	0.000430	0.00151	-0.000245
	(0.00316)	(0.00430)	(0.00533)	(0.000973)	(0.00111)	(0.00215)
Leverage						
EQNL	-0.000739***	-0.000974*	-0.000492	-0.000186*	-0.000337***	-0.000116
	(0.000284)	(0.000567)	(0.000343)	(0.000107)	(0.000121)	(0.000157)
Risk						
TOTRISK	51.89***	74.60***	33.10***	5.028	4.266	5.356
	(9.752)	(15.75)	(12.55)	(3.221)	(3.204)	(5.728)
DENS	0.00153	0.00359**	0.000222	-0.000176	-0.000296	-0.000242
	(0.00101)	(0.00148)	(0.00112)	(0.000280)	(0.000282)	(0.000415)
Constant	-0.00784	-0.0317	0.0263	0.00497	0.000406	0.00901
	(0.0153)	(0.0219)	(0.0197)	(0.00405)	(0.00351)	(0.00769)
Obs.	262	111	151	262	111	151
Adjusted R^2	0.34993	0. 47197	0. 35681	0. 04682	0. 05340	0. 02802

Sources: Authors' calculation.

Note: This table reports linear regressions of markets' reactions over opacity and some control variables. In each of these regressions, standard errors are estimated using the Huber-White sandwich estimators (hence we have robust standard errors). Such robust standard errors can deal with a collection of minor concerns about failure to meet assumptions, such as minor problems about normality, heteroscedasticity, or some observations that exhibit large residuals, leverage or influence. The dependent variable *|CAR|* is the absolute value of the cumulative abnormal returns calculated over five days' event window ((-2, +2)). The dependent variable SCAV is the standardized cumulative abnormal trading volume calculated over five days' event window ((-2, +2)). The opacity (independent) variable is SYNC, which represents the bank stock price synchronicity. As control variables, CI represents the ratio of cost to income; ROAA is the returns on average assets; NIM is the net interest margin; LIQ is the ratio of liquid assets to customer and short term funds; EQNL is the ratio of equity to net loans; PBV is the ratio of price to book value; NPL is the ratio of impaired loans to gross loans; TOTRISK is the stock total risk; DENS is the ratio of risk weighted assets to total assets. The estimations are done considering the whole sample of banks (***All banks***), the sample of ***less opaque banks*** and the sample of ***more opaque banks***. We distinguish less and more opaque banks basing on the values of the variable SYNC related to the 2011 stress test (for Europe banks) and the 2013 stress test (for US banks). Considering the resulting median value of SYNC, the banks whose SYNC value is inferior to the median value (i.e. -0.1521) are considered as the less opaque banks and inversely, the banks whose SYNC value is higher than the median value are considered as the more opaque banks. Robust standard errors are in parenthesis. *, **, *** indicate respectively significance at 10%, 5% and 1% levels.

Although the SYNC variable is not significant on the whole sample of the |CAR| model, the samples of less opaque and more opaque banks highlight significant but opposite results. Therefore, the non-significant results on the whole sample could be explain by the fact that the opposite effects of the two sub-samples cancel each other when we consider the global sample. The positive and significant (at 5% level) coefficient of SYNC on the sample of less opaque banks suggest that for these banks, investors tend to react highly (weakly) for banks that have high (low) opacity level. When we consider the sample of more opaque banks, the SYNC's coefficient is significant (at 1% level) but negative; the market reaction is weak (high) when the bank is highly (weakly) opaque. One can expect that the investors' reaction be higher for the highly opaque banks because of the transparency brought by stress tests results' disclosure. Indeed, investors would re-valuate banks stock prices by taking into account the new information brought by stress tests. Our finding suggests that this hypothesis is valid only when the opacity of the bank is not at a high degree. This could be explained by the fact that the stress test did not bring enough transparency to cause high market reaction on banks with high level opacity.

To extend the analysis, we take account in the estimation the fact that the bank participated or not to the stress test exercise in order to check if this consideration will affect the results found in Table 7. So, we include in the original model a dummy variable equal to 1 if the bank is tested and 0 otherwise. Thus, each explanatory variable in the model is interacted with the dummy variable. Considering the results found in Table 7, one could expect in this case that the opacity variable gets higher positive effect (meaning higher positive reaction) for tested banks (compared to non-tested banks) because it is for these banks that the stress test results are released. The coefficient associated to SYNC in Table 8 is considered as the marginal effect of SYNC on the dependent variable when we are on the sample of non-tested banks while for tested banks, the marginal effect is the sum of the SYNC's coefficient and of the coefficient associated to the interaction of SYNC with the dummy variable indicating if the bank participates or not to the stress test (stressdummy). We also report in Table 8 the significance test of the tested banks marginal effect.

Table 8: Linear regression of market's reactions over opacity and control variables including stress test participating dummy variable.

Variables	|CAR|			SCAV		
	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*
	All banks	**Less opaque**	**More opaque**	**All banks**	**Less opaque**	**More opaque**
stressdummy	-0.0206	0.0545	-0.0192	0.00795	0.0189	-0.00102
	(0.0327)	(0.118)	(0.0450)	(0.00902)	(0.0180)	(0.0171)
Opacity						
SYNC	0.00207	0.00553*	-0.0446***	0.00113***	0.000368	-0.00340
	(0.00224)	(0.00282)	(0.0169)	(0.000427)	(0.000800)	(0.00504)
SYNC× stressdummy	-0.00293	0.000805	0.0352*	0.00104	4.61e-05	0.00767
	(0.00382)	(0.00539)	(0.0191)	(0.000980)	(0.00152)	(0.00609)
SYNC + SYNC× stresdummy	-0.00086	0.00634	-0.0094	0.00217**	0.00041	0.00427
Liquidity						
LIQ	0.000330**	0.000439*	0.000353**	6.89e-05*	4.10e-05	5.32e-05
	(0.000140)	(0.000247)	(0.000178)	(3.67e-05)	(3.61e-05)	(6.40e-05)
LIQ× stressdummy	-0.000220	-8.94e-05	-0.000326	-0.000157***	-8.46e-06	-0.000153*
	(0.000184)	(0.000600)	(0.000221)	(5.84e-05)	(9.64e-05)	(8.36e-05)
NPL	0.00201***	0.00159**	0.00415***	6.24e-05	-2.40e-05	3.61e-05
	(0.000635)	(0.000737)	(0.00145)	(0.000123)	(0.000190)	(0.000481)
NPL× stressdummy	-0.00117	-0.000642	-0.00288*	-0.000201	0.000214	-0.000160
	(0.000959)	(0.00209)	(0.00164)	(0.000308)	(0.000462)	(0.000616)
Efficiency						
CI	0.000224	0.000501	0.000122	-1.02e-05	-1.45e-05	1.75e-05
	(0.000267)	(0.000356)	(0.000303)	(6.07e-05)	(4.94e-05)	(0.000106)
CI× stressdummy	0.000625*	0.000691	0.000590	-4.53e-05	-2.55e-05	-7.31e-06
	(0.000330)	(0.000489)	(0.000421)	(8.63e-05)	(9.62e-05)	(0.000158)
ROAA	0.0114*	0.0226***	0.0129**	0.00386***	0.00123	0.00777***
	(0.00662)	(0.00791)	(0.00621)	(0.00146)	(0.00131)	(0.00259)
ROAA× stressdummy	-0.000597	0.0216	-0.00477	-0.00784**	0.00276	-0.0129***
	(0.0117)	(0.0246)	(0.0109)	(0.00305)	(0.00422)	(0.00480)
NIM	-0.00224	-0.00117	0.000262	-0.000120	0.000513	-0.00150
	(0.00207)	(0.00261)	(0.00393)	(0.000527)	(0.000861)	(0.00123)
NIM× stressdummy	-0.000426	0.00713	-0.00371	-0.000341	0.00269	0.00117
	(0.00348)	(0.0108)	(0.00478)	(0.00112)	(0.00234)	(0.00187)
PBV	-0.00319	-0.00972**	0.00146	-0.000103	0.00193	-0.00476
	(0.00384)	(0.00467)	(0.00792)	(0.00116)	(0.00129)	(0.00295)
PBV× stressdummy	-0.00132	-0.0288	-0.00754	0.00456*	-0.00801*	0.0117**
	(0.00712)	(0.0256)	(0.0108)	(0.00264)	(0.00446)	(0.00464)
Leverage						
EQNL	-0.000907*	-0.000988	-0.000689	-0.000297**	-0.000321**	-0.000305
	(0.000475)	(0.000720)	(0.000870)	(0.000120)	(0.000123)	(0.000264)
EQNL× stressdummy	-0.000386	-0.00386	-1.14e-05	0.000299	-0.000972	0.000232
	(0.000625)	(0.00439)	(0.000949)	(0.000193)	(0.000694)	(0.000325)
Risk						
TOTRISK	62.52***	76.47***	22.14	2.300	2.307	-4.302
	(14.06)	(17.87)	(29.26)	(3.679)	(3.274)	(10.98)
TOTRISK× stressdummy	-23.77	-61.49	16.89	9.447	-0.666	17.96
	(19.77)	(57.99)	(32.46)	(7.133)	(15.92)	(13.30)
DENS	0.000675	0.00319	-0.000509	6.58e-05	-0.000380	0.000480
	(0.00134)	(0.00197)	(0.00227)	(0.000355)	(0.000333)	(0.000730)
DENS× stressdummy	0.000432	-0.00229	0.000838	-0.000731	-0.000504	-0.00135
	(0.00228)	(0.00523)	(0.00280)	(0.000554)	(0.00102)	(0.000903)
Constant	0.0154	-0.0200	0.0233	0.00164	0.00296	0.00658
	(0.0252)	(0.0332)	(0.0392)	(0.00592)	(0.00448)	(0.0141)
Obs.	262	111	151	262	111	151
Adjusted R^2	0.36473	0.45654	0.38303	0.09228	0.00585	0.07189
Stressdummy	YES	YES	YES	YES	YES	YES

Sources: Authors' calculation.

Note: This table reports linear regressions of markets' reactions over opacity and some control variables. In each of these regressions, standard errors are estimated using the Huber-White sandwich estimators (hence we have robust standard errors). Such robust standard errors can deal with a collection of minor concerns about failure to meet assumptions, such as minor problems about normality, heteroscedasticity, or some observations that exhibit large residuals, leverage or influence. The dependent variable |*CAR*| is the absolute value of the cumulative abnormal returns calculated over five days' event window ((-2, +2)). The dependent variable SCAV is the standardized cumulative abnormal trading volume calculated over five days' event window ((-2, +2)). The opacity (independent) variable is SYNC, which represents the bank stock price synchronicity. As control variables, CI represents the ratio of cost to income; ROAA is the returns on average assets; NIM is the net interest margin; LIQ is the ratio of liquid assets to customer and short term funds; EQNL is the ratio of equity to net loans; PBV is the ratio of price to book value; NPL is the ratio of impaired loans to gross loans; TOTRISK is the stock total risk; DENS is the ratio of risk weighted assets to total assets. Stressdummy is a variable equal to 1 if the bank participated to the stress test and equal to 0 if the bank do not participated to the stress test. The estimations are done considering the whole sample of banks (***All banks***), the sample of ***less opaque banks*** and the sample of ***more opaque banks***. We distinguish less and more opaque banks basing on the values of the variable SYNC related to the 2011 stress test (for Europe banks) and the 2013 stress test (for US banks). Considering the resulting median value of SYNC, the banks whose SYNC value is inferior to the median value (i.e. -0.1521) are considered as the less opaque banks and inversely, the banks whose SYNC value is higher than the median value are considered as the more opaque banks. Robust standard errors are in parenthesis. *, **, *** indicate respectively significance at 10%, 5% and 1% levels.

The results in Table 8 are not significantly different from the previous results in Table 7 when we consider the whole sample of banks. We remark also that the including of stressdummy in the model does not change the relation between the |CAR| and SYNC. The coefficient of SYNC is still positive for the less opaque banks and negative for more opaque banks meaning that the results found in Table 7 is not affected by the fact that the bank is tested or not. Furthermore, the fact that the total marginal effect (SYNC + SYNC*stressdummy) is not significant means that there is no different significant reaction between tested and non-tested banks. This confirms our previous results found when we analyzed the |CAR| which suggest that market participants react globally without taking account if the bank is tested or not.

In addition, we investigate also if the country provenance of the bank will affect the effect of opacity on market reactions according to the degree of banks' opacity. Thus, we create a new dummy variable equal to 1 when the bank comes from Europe and 0 otherwise (ctrydummy). Each explanatory variable in the model is interacted with the dummy variable as in the estimation of Table 8.

Table 9: Linear regression of market's reactions over opacity and control variables including country provenance dummy variable.

Variables	|CAR|			SCAV		
	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*
	All banks	**Less opaque**	**More opaque**	**All banks**	**Less opaque**	**More opaque**
ctrydummy	-0.0964***	Omitted	-0.0646	0.0121	Omitted	0.0240
	(0.0356)		(0.0528)	(0.0166)		(0.0223)
Opacity						
SYNC	-0.00310	0.220***	-0.00323	0.000764	0.219***	-0.00130
	(0.00535)	(0.0106)	(0.0102)	(0.000821)	(0.00155)	(0.00473)
SYNC× ctrydummy	0.00168	-0.213***	-0.0267*	0.000275	-0.219***	0.00190
	(0.00576)	(0.00973)	(0.0143)	(0.000968)	(0.00144)	(0.00602)
SYNC + SYNC× ctrydummy	-0.00142	0.007**	-0.02993***	0.001039**	0	0.0006
Liquidity						
LIQ	0.000169	-0.0150***	0.000145	6.98e-05	-0.0215***	4.68e-05
	(0.000163)	(0.00111)	(0.000175)	(8.72e-05)	(0.000163)	(0.000105)
LIQ× ctrydummy	5.00e-05	0.0154***	6.33e-07	-6.88e-05	0.0215***	-8.32e-05
	(0.000199)	(0.00117)	(0.000260)	(9.35e-05)	(0.000175)	(0.000124)
NPL	0.00308*	-0.114***	0.00307	9.80e-05	-0.121***	0.000342
	(0.00180)	(0.00590)	(0.00222)	(0.000705)	(0.000871)	(0.000827)
NPL× ctrydummy	-0.000933	0.115***	0.000132	0.000181	0.121***	-0.000409
	(0.00191)	(0.00593)	(0.00241)	(0.000725)	(0.000912)	(0.000933)
Efficiency						
CI	-9.65e-05	0.0200***	-0.000106	-4.72e-05	0.0191***	-3.06e-05
	(0.000237)	(0.000819)	(0.000279)	(0.000123)	(0.000127)	(0.000148)
CI× ctrydummy	0.000772**	-0.0194***	0.000579	2.16e-05	-0.0191***	-6.61e-05
	(0.000299)	(0.000917)	(0.000439)	(0.000131)	(0.000141)	(0.000181)
ROAA	-0.00281	0.0259***	-0.00394	0.00364	0.00146	0.00382
	(0.00548)	(0.00711)	(0.00652)	(0.00247)	(0.00110)	(0.00289)
ROAA× ctrydummy	0.0210**	Omitted	0.0342***	-0.00241	Omitted	-0.00579
	(0.00822)		(0.0111)	(0.00285)		(0.00513)
NIM	-0.000447	0.244***	-0.00102	0.000751	0.268***	-3.51e-05
	(0.00194)	(0.0122)	(0.00247)	(0.000935)	(0.00177)	(0.00108)
NIM× ctrydummy	-0.00630*	-0.246***	-0.0139***	-0.00227*	-0.269***	-0.00207
	(0.00337)	(0.0126)	(0.00471)	(0.00119)	(0.00201)	(0.00212)
PBV	-0.00271	-0.140***	-0.000878	-0.000632	-0.104***	-0.00181
	(0.00525)	(0.00517)	(0.00657)	(0.00193)	(0.000768)	(0.00245)
PBV× ctrydummy	0.00107	0.128***	-0.00585	0.00138	0.106***	0.000325
	(0.00668)	(0.00497)	(0.0128)	(0.00220)	(0.00117)	(0.00501)
Leverage						
EQNL	-0.000560	-0.0641***	-0.000632	1.32e-05	-0.0651***	3.86e-05
	(0.000618)	(0.00415)	(0.000672)	(0.000318)	(0.000615)	(0.000365)
EQNL× ctrydummy	1.70e-05	0.0630***	0.000359	-0.000335	0.0649***	-0.000373
	(0.000769)	(0.00384)	(0.00106)	(0.000346)	(0.000563)	(0.000441)
Risk						
TOTRISK	3.392	Omitted	6.192	0.226	Omitted	-2.806
	(14.61)		(15.19)	(8.108)		(8.400)
TOTRISK× ctrydummy	55.50***	81.96***	45.35*	7.170	1.830	15.95
	(20.04)	(17.06)	(24.00)	(8.975)	(3.530)	(12.09)
DENS	-0.00133	-0.0533***	-0.00187	2.74e-05	-0.0620***	0.000238
	(0.00177)	(0.00264)	(0.00216)	(0.000799)	(0.000408)	(0.000997)
DENS× ctrydummy	0.00401*	0.0559***	0.00248	-0.000558	0.0619***	-0.00117
	(0.00222)	(0.00153)	(0.00270)	(0.000859)	(0.000249)	(0.00112)
Constant	0.0647**	-0.0183	0.0709**	-0.00253	-0.000395	-0.000756
	(0.0296)	(0.0255)	(0.0345)	(0.0161)	(0.00357)	(0.0190)
Obs.	262	111	151	262	111	151
Adjusted R^2	0. 36642	0.45491	0.38782	0.07024	0.28483	0.02614
Ctrydummy	YES	YES	YES	YES	YES	YES

Sources: Authors' calculation.

Note: This table reports linear regressions of markets' reactions over opacity and some control variables. In each of these regressions, standard errors are estimated using the Huber-White sandwich estimators (hence we have robust standard errors). Such robust standard errors can deal with a collection of minor concerns about failure to meet assumptions, such as minor problems about normality, heteroscedasticity, or some observations that exhibit large residuals, leverage or influence. The dependent variable |*CAR*| is the absolute value of the cumulative abnormal returns calculated over five days' event window ((-2, +2)). The dependent variable SCAV is the standardized cumulative abnormal trading volume calculated over five days' event window ((-2, +2)). The opacity (independent) variable is SYNC, which represents the bank stock price synchronicity. As control variables, CI represents the ratio of cost to income; ROAA is the returns on average assets; NIM is the net interest margin; LIQ is the ratio of liquid assets to customer and short term funds; EQNL is the ratio of equity to net loans; PBV is the ratio of price to book value; NPL is the ratio of impaired loans to gross loans; TOTRISK is the stock total risk; DENS is the ratio of risk weighted assets to total assets. Ctrydummy is a dummy variable equal to 1 when the bank comes from Europe and equal to 0 when the banks comes from the U.S. The estimations are done considering the whole sample of banks (***All banks***), the sample of ***less opaque banks*** and the sample of ***more opaque banks***. We distinguish less and more opaque banks basing on the values of the variable SYNC related to the 2011 stress test (for Europe banks) and the 2013 stress test (for US banks). Considering the resulting median value of SYNC, the banks whose SYNC value is inferior to the median value (i.e. -0.1521) are considered as the less opaque banks and inversely, the banks whose SYNC value is higher than the median value are considered as the more opaque banks. Robust standard errors are in parenthesis. *, **, *** indicate respectively significance at 10%, 5% and 1% levels.

The results in Table 9 show that on the whole sample of banks, the coefficient of SYNC is still non-significant. When we consider the sub-samples of less opaque and more opaque banks, the SYNC's coefficients are opposed like results found in Table 7. For the less opaque banks, the marginal effects are significant both for banks from Europe and banks from the U.S., with a higher effect for US banks. On the more opaque banks' sample, the marginal effect is not significant for banks from US while we find a significant but negative effect for European banks. When we analyze investors' reactions in Table 5 and Table 6, we saw that European banks are more opaque than US banks. So, even that on the sample of more opaque banks the marginal effect is negative, the fact that this marginal effect is significant means that financial markets react significantly for banks whose opacity is higher (European banks).

These cross-sectional estimations show that investors' reactions are affected by the degree of bank opacity only when this bank opacity is not very high. In this case, more the bank is opaque and more investors' reaction related to the banks' news is high. Moreover, this result is not affected by the fact that the bank is tested or not tested or by the fact that the bank is from Europe or the U.S.

2.5. Conclusion

In this paper, we studied whether investors' reaction to banks' information disclosed on the financial market is different according to the opacity degree of these banks. As information, we consider stress tests results' disclosure since these stress tests are expected to bring transparency about banks' financial health and reduce their opacity. By first using an event study, we bring evidence that market participants react significantly to the stress tests announcements. Indeed,

we find that the considered stress tests provided new relevant information to the market about, not only tested banks' situation, but also non-tested banks' one; new information which generated a significant reaction from the market. Secondly, we carried out a cross-sectional regression in which we show that investors' reaction is positively related to the degree of banks' opacity only when the opaqueness of the bank is not at a high level. In contrast, when the opacity of the bank is high, the market reaction tends to be low.

This result suggests that stress tests do not actually reduce the opacity of the banks that are highly opaque. Hence, regulators should make more an effort to identify banks which are highly opaque before releasing stress tests' results. A different treatment could be done for these banks in the disclosure process to better restore investors' confidence on the financial market.

Appendix:

Table A1: European tested banking institutions including in our study sample

N°	*Country*	*Name of the institution*	*Participated to:*	
			2011 EU-wide Stress test	*2014 EU-wide Stress test*
1	Austria	Erste Group Bank AG	Yes	Yes
2	Austria	Raiffeisen Bank International	Yes	Yes
3	Belgium	KBC Groep NV	Yes	Yes
4	Belgium	Dexia SA	Yes	Yes
5	Britain	HSBC Holdings PLC	Yes	Yes
6	Britain	Lloyds Banking Group PLC	Yes	Yes
7	Britain	Barclays PLC	Yes	Yes
8	Britain	Royal Bank of Scotland Group P	Yes	Yes
9	Cyprus	Hellenic Bank PCL	No	Yes
10	Denmark	Danske Bank A/S	Yes	Yes
11	Denmark	Jyske Bank A/S	Yes	Yes
12	Denmark	Sydbank A/S	Yes	Yes
13	France	BNP Paribas SA	Yes	Yes
14	France	Societe Generale SA	Yes	Yes
15	France	Credit Agricole SA	Yes	Yes
16	Germany	Deutsche Bank AG	Yes	Yes
17	Germany	Commerzbank AG	Yes	Yes
18	Germany	IKB Deutsche Industriebank AG	No	Yes
19	Greece	Alpha Bank AE	Yes	Yes
20	Greece	National Bank of Greece SA	Yes	Yes
21	Greece	Eurobank Ergasias SA	Yes	Yes
22	Greece	Piraeus Bank SA	Yes	Yes
23	Hungary	OTP Bank PLC	Yes	Yes
24	Ireland	Allied Irish Banks PLC	Yes	Yes
25	Ireland	Permanent TSB Group Holdings P	No	Yes
26	Italy	Intesa Sanpaolo SpA	Yes	Yes
27	Italy	UniCredit SpA	Yes	Yes
28	Italy	Mediobanca SpA	No	Yes
29	Italy	Unione di Banche Italiane SpA	Yes	Yes
30	Italy	Banco Popolare SC	Yes	Yes
31	Italy	Banca Popolare dell'Emilia Rom	No	Yes
32	Italy	Banca Monte dei Paschi di Sien	Yes	Yes
33	Italy	Banca Carige SpA	No	Yes
34	Malta	Bank of Valletta PLC	Yes	Yes
35	Netherlands	ING Groep NV	Yes	Yes
36	Norway	DNB ASA	Yes	Yes
37	Poland	Powszechna Kasa Oszczednosci B	Yes	Yes
38	Poland	Bank BPH SA	No	Yes
39	Portugal	Banco Comercial Portugues SA	Yes	Yes
40	Portugal	Banco BPI SA	Yes	Yes
41	Spain	Banco Santander SA	Yes	Yes
42	Spain	Banco Bilbao Vizcaya Argentari	Yes	Yes
43	Spain	Banco de Sabadell SA	Yes	Yes
44	Spain	Bankinter SA	Yes	Yes
45	Spain	Banco Popular Espanol SA	Yes	Yes
46	Sweden	Nordea Bank AB	Yes	Yes
47	Sweden	Svenska Handelsbanken AB	Yes	Yes
48	Sweden	Swedbank AB	Yes	Yes
49	Sweden	Skandinaviska Enskilda Banken	Yes	Yes

Table A2: United-States tested banking institutions including in our study sample

N°	*Country*	*Name of the institution*	*Participated to*	
			2013 DFA Stress test	*2015 DFA Stress test*
1	United States	Bank of America Corp	Yes	Yes
2	United States	BB&T Corp	Yes	Yes
3	United States	Citigroup Inc	Yes	Yes
4	United States	Comerica Inc	No	Yes
5	United States	Fifth Third Bancorp	Yes	Yes
6	United States	JPMorgan Chase & Co	Yes	Yes
7	United States	KeyCorp	Yes	Yes
8	United States	M&T Bank Corp	No	Yes
9	United States	Regions Financial Corp	Yes	Yes
10	United States	SunTrust Banks Inc	Yes	Yes
11	United States	US Bancorp	Yes	Yes
12	United States	Wells Fargo & Co	Yes	Yes
13	United States	Zions Bancorporation	No	Yes
14	United States	American Express Co	Yes	Yes
15	United States	Capital One Financial Corp	Yes	Yes
16	United States	Discover Financial Services	No	Yes
17	United States	Goldman Sachs Group Inc/The	Yes	Yes
18	United States	Huntington Bancshares Inc/OH	No	Yes
19	United States	Morgan Stanley	Yes	Yes
20	United States	Northern Trust Corp	No	Yes
21	United States	PNC Financial Services Group Inc	Yes	Yes
22	United States	State Street Corp	Yes	Yes
23	United States	Bank of New York Mellon Corp	Yes	Yes

CHAPTER 3

What is the information value of bank's stress tests? *An investigation using banks' bond split ratings*

3.1. Introduction

Banking sector is one of the most regulated sectors in the economy in order to protect debt holders, especially depositors, and to prevent systemic risk. Arguments supporting the regulation of banks generally stem from asymmetric information which characterizes banks' activities (Santos, 2001). Because of the high bank opacity, it may be difficult for market's participants to correctly anticipate the performance and evaluate the riskiness of banks. For this reason, the role of credit rating agencies is especially crucial for banks. Financial ratings hold a key position in the financial market due to the signal they provide to investors. A strong financial rating permits to a firm to get an easier access to capital market with better conditions and is a very useful signal for depositors, debtors, regulators, etc. However, financial ratings have some inconsistencies identified in the literature (Shen et al., 2012). One of them is the fact that the same firm can receive different level of ratings from several rating agencies (Ederington, 1985; Beattie and Searle, 1992; Moon and Stotsky, 1993; Cantor and Packer, 1994) depending on how the agencies analyze public information and especially private information they manage to collect from rated firms. Contrarily to the common agents on the financial market, credit rating agencies have ability to access to private information. This ability is facilitated by the cooperation from the issuers as well as their willingness to share even confidential information. Hence, the rating disagreements or split ratings could be the results of dissimilar sets of information among rating agencies but could also reveal differences of interpretation of the various contents of these different sets of information.

Several studies show that both assets opaqueness and information asymmetry cause rating disagreements (Jewell and Livingston, 1998; Livingston et al. 2006, 2007). Morgan (2002) and Iannotta (2006) show that Moody's and Standard & Poor's have more split ratings over financial intermediaries than over non-financial firms, suggesting that banks are more difficult to rate because of the opacity of their assets and their high leverage. Even if prudential regulation tends to favor market discipline, the opaqueness of banks remains a concern for the regulatory authorities. Since the end of the 2008 financial crisis, European and American regulators, among others, have conducted different stress tests exercises in order to provide reliable information about banks and restore investors' confidence. A numerous literature tries to assess the efficiency of these tests. Petrella and Resti (2011), Morgan et al. (2013), Flannery et al. (2015) give some evidence that investors react to the information disclosed by the stress

tests meaning that there is a decrease in banks' opacity due to the transparency brought by the stress tests results.

In this paper, we aim to appreciate the informative value of stress tests by investigating the impact of the disclosure of the stress tests results on banks' bonds split ratings. To our knowledge, our paper is the first one to use bond split ratings as a measure of the effectiveness of bank stress tests assuming that a growing convergence of views on banks credit risk between rating agencies implies an improvement of market discipline.

We consider all the stress tests conducted in Europe (3) and in the United-States (6) between 2009 and 2015. During this period of time, Europe has faced the 2010 sovereign crisis which hit harder the European banks because of their high exposure to the sovereign debt. This has also created a need for higher information and transparency about banks' financial health and their resilience to the sovereign crisis. Hence, the disclosure of the European stress tests results is increasingly detailed and includes an original dataset unknown before, i.e. detailed banks' exposures to sovereign debt. Thus, in the European stress tests, besides the assessment of banks resilience in the stress tests' adverse scenario, the stress tests results bring some new information not available in the financial market. In the US banks stress tests, the type of data disclosed corresponds to general information which can be found in banks' balance sheets but data are stressed. The US banks tests have the advantage of being conducted by a single regulator contrarily to the European tests that involve contributions of multiple regulators of different countries. This permits the US to exhibit to the financial market unified remedial measures for troubled banks according to the stress tests results and, if necessary, to lead the US Treasury to take actions. Because there is no common fiscal policy in Europe, remedial measures would depend on the fiscal policy of each country affected. These differences between European and US banks stress tests make relevant a comparative analysis. The impact of information disclosure gives rise to a vibrant debate in literature. One of the benefits of the stress test results disclosure is the possibility to increase the investors' confidence about the banking sector by the transparency brought and to favor market discipline. Indeed, it should give investors better insights about the banks' risk exposure and market prices should be adjusted accordingly. Anticipating this process, banks' managers would be engaged in less risk taking. These advantages of disclosure could have a positive effect on banks and lead, thanks to the transparency provided by the stress test, to a convergence of market assessments and a reduction of disagreement among rating agencies. The banks being highly opaque, we can also

consider that the more the stress tests are repetitive over the years, the more the bank opacity may decrease.

However, more disclosure is not necessarily a synonym of transparency and it could create negative externalities. Gaballo (2016), analyzing the social value of information about the future, suggests that when news cannot be communicated without ambiguity, if information could be subject to different interpretations by financial market's participants, policymakers should not make announcements or publish information about future fundamentals unless they implement the appropriate policy. Otherwise, information disclosure could have negative impact on the social value. Furthermore, Hirshleifer (1971) shows that if too much information is disclosed, it destroys risk sharing opportunities. Goldstein and Sapra (2013) suggest that Hirshleifer effect is particularly high when disclosure unfolds during non-crisis periods. Bhojraj and Libby (2005) and Cheng et al. (2010) argue that frequent disclosure makes corporate managers become myopic. The myopic behavior means that the managers tend to sacrifice the long-term growth for the purpose of meeting the short-term goals. If a bank is stress tested, managers can have the incentives to sacrifice the bank long-term strategy and undertake short-term actions that will permit them to pass the stress test exercise. On the other hand, the banks' creditors face strong strategic complementarities i.e. their incentives to act similarly are particularly high (Chen et al. (2010)). In this case, disclosure would be beneficial only if the quality and the precision of the information being disclosed are sufficiently high. In this vein, Banerjee and Maier (2015) analyze how transparency affects coordination failure and economic efficiency. Indeed, high public disclosure reduces uncertainty about economic fundamentals but it can increases uncertainty about agents' actions. They find that granular public disclosure, which is disaggregated and precise, increases the likelihood of coordination failure and decreases economic efficiency when public information is pessimistic about future economic prospects. They also find that this negative effect of granularity is stronger when strategic complementarity [27] is high.

These theoretical studies suggest that the release of information is not necessary beneficial for the market particularly if the information could be subject to a subjective interpretation by the financial market's participants. The disclosure of the stress tests information may increase the transparency of banks' assets and the confidence of the market's participants in the banking

[27] Strategy complementarity is the fact that the incentives of an agent to act increase as other agents take the same action.

system and this increase of confidence would, in turn, affect positively the real economy. In this case and in the absence of any externalities related to disclosure, disagreements between rating agencies should decrease. But if stress tests are not properly designed, the disclosure may create more panic in the financial market and thereby lower the confidence in the banking sector. Furthermore, Goldstein and Sapra (2013) suggest that there is an endogenous cost associated to the disclosure of stress test and explain how these cost could be minimized via the design of the stress test and the nature of disclosure. The authors also argue that because banks operate in a *second-best* environment i.e., environments with market and informational frictions, the conventional wisdom that more disclosure leads to better market discipline of banks due to an increase in transparency does not hold.

Ismail et al. (2015) using various proxies of asymmetric information (debt-to-equity ratio, price-to-earnings ratio, price-to-book ratio, standard deviation of forecasted Earning Per Share) and data from advanced and emerging bond markets, found evidence that split ratings on bonds issued by firms are caused by asymmetric information between firms and credit rating agencies. Shen et al. (2012) analyzing banks' financial information and country information level found also that the effects of financial ratios on ratings are significantly affected by information asymmetries. Haggar et al. (2008), analyzing the impact of firms' voluntary disclosure on firms' stock price movements, found that the disclosure of firm specific information contributes to more informative stock prices and reduces the uncertainty about firms to less split rating on firms' securities. Healy and Palepu (2001) has noted in prior research that a credible and expanded disclosure represents an important mechanism through which insiders disclose firm-specific private information. By analyzing a large sample of firm-year observations, Bowe and Larik (2014) found that large, profitable companies with enhanced interest coverage, a greater percentage of independent directors and more institutional investment are less likely to receive rating splits.

So, more disclosure could as well increase transparency or increase uncertainty and, in the case we focus on, give ambiguous results on split rating between agencies. Our contribution tries to provide some answers from a statistical and econometrical analysis. We first consider bonds jointly rated by Moody's and Standard & Poor's for banks participating to the European and US banks stress tests. First, we statistically analyze bonds' ratings before and after each stress test to establish if the results disclosure has an impact on the disagreements between agencies, i.e. if the information provided leads to a reduction of split ratings, what would be logical from the typical expected effect of a greater and shared information, or if it leads to an increase of

split ratings, what would on the opposite give weight to all counterintuitive interpretations identified both in theoretical and empirical literature. Second, we estimate an econometrical model relating a specific measure of the split rating change to key data from the stress test results trying to analyze if and how the stress variables explain why Moody's and Standard & Poor's agree or disagree more after than before the disclosure. For each stress test, we select the more representative variables of the disclosed results, those indicating the expected strengths or weaknesses of a bank (banks' credit exposure, banks' capital, banks' profitability…).

Our results suggest that the disclosure of stress tests results has mixed effect on split ratings. Looking at the successive tests, we can clearly identify the first European (2010) and two first American (2009, 2011) tests, those following the global financial crisis, and the 2014 tests both in EU and the US, as those that best correspond to a counterintuitive and maybe counterproductive impact of information disclosure since they reveal a higher divergence of the two rating agencies in the post stress test periods. This mixed effect of stress tests is confirmed by the regressions relating the split ratings to data from the stress tests results disclosure. The stressed risk, capital and profitability variables impact significantly or not, sometime in opposite way, the change in average absolute rating gap around each stress test. Credibility of the stress tests, the period of disclosure (crisis or non-crisis period), the backstops measures proposed by the regulators, the individual stress test analysis of each agents and other externalities related to disclosure, could lead to different perceptions of stress test between market's participants and could contribute to explain this mixed effect of disclosure. Our finding suggests a frequent divergence of interpretation of the stress test results between the two rating agencies meaning that information would not be as relevant as hoped by regulators, market players certainly could not extract an unambiguous signal of all the results disclosed by the stress tests. The rest of the paper is organized as follows: section 2 presents key features of Europe and US stress tests, section 3 the sample and the methodology of our empirical analysis, section 4 the results and section 5 concludes.

3.2. Key features of the stress tests in the US and Europe:

Since the end of the 2008 financial crisis, regulators have conducted different stress test exercises to provide information on banks with the hope to restore investors' confidence. Stress tests in the United-States and in Europe differ in their governance but also in the granularity of

their results disclosed. The first stress test or SCAP (Supervisory Capital Assessment Program) was conducted in US in 2009 in order to respond to the market participant's concerns about US banks financial health at the end of the 2008 financial crisis. This first US stress test required the 19 largest US Banks Holding Companies (BHCs)[28] to simultaneously undergo a forward-looking exam in order to determine if they have enough capital to support lending in the event of an unexpected severe recession. In the case that the banks' capital is inadequate, they would be bailout by public funds through the Capital Assistance Plan (CAP) announced on the same day as the stress test results. Since 2011, the Comprehensive Capital Analysis and Review (CCAR) is the regulatory framework of the Federal Reserve. Unlike a simple stress test, the CCAR has two steps. First, in a quantitative assessment or stress test, the Federal Reserve evaluates each BHC's ability to maintain post-stress capital ratios above a minimum threshold of tier 1 common capital ratio during each quarter of the planning. Second, a qualitative assessment covers all key areas of BHCs' capital planning processes and involves a large number of experts from the Federal Reserve System. Since 2013, the Dodd-Frank Act has required the Federal Reserve to conduct every year a stress test in addition to the CCAR. The Dodd-Frank Act stress test (DFAST) has only the quantitative approach. The main difference between the Dodd-Frank Act stress test and the CCAR quantitative assessment is the fact that the DFAST is conducted on a static balance sheet basis while the CCAR quantitative assessment is conducted on a dynamic balance sheet basis. However, the BHCs sample is the same for both tests.

In Europe, the European Banking Authority (EBA) conducted a stress test in 2010 based on 91 banks and another in 2011 based on 90 banks to reassure financial markets on the banks' resilience to the sovereign debt crisis but also to bring more transparency about banks' statements. The European stress tests are generally implemented by banks themselves following the methodology defined by the EBA and results are transmitted to the central regulators by national supervisors. In 2014 and in order to prepare the Single Supervisory Mechanism (SSM), the European Central Bank in close cooperation with the EBA conducted another stress test based on 130 banks which was more global and included asset quality review (AQR). The AQR is an assessment of the accuracy of the carrying value of banks' assets at December 31, 2013 which is the starting point of the stress test.

[28] 19 BHCs participated in the 2009, 2011 and 2012 stress tests, 18 in 2014 and 31 in 2015.

Both Europe and US stress tests evaluate the ability of the different banks to maintain post-stress test capital ratios that are above the minimum required during the adverse scenarios. Banks that did not reach the minimum capital required are considered as failing the stress test exercise. The amount of data disclosed is greater in the European tests and more granular than in the US test. The purpose of any stress test is to identify the troubled banks and to inform the market about the backstop measures to be taken to solve the identified problems of banks. Compared to the US, we can emphasize two main differences related to Europe in conducting stress test. The first one is the fact that in Europe there are multiple banking supervisors belonging to each country. There is not a common policy for banks bailout and this could make the backstops measures less reassuring for the financial market. This is why the ECB started to take the role of a single supervisor in the Eurozone area. Second, even if there is now a single supervisor for major banks, European countries still do not have a single fiscal policy, which limits the powers of the banking union supervision initiated by the ECB. Orphanided (2014) argues that a true banking union must include supervision, common deposit guarantees and common resolution mechanism. While this is not the case for the European countries for now, it is the features in the US where the only banking supervisor is the Federal Reserve and the fiscal policy is common for all the states of the Union. In Table 1, we present the disclosure dates of the different stress tests conducted in Europe and in the United-States. Note that for the United-States, starting in 2013, the Federal Reserve conducts at the same time both DFAST and CCAR and discloses first the DFAST's results, one week before the CCAR's results. In our study, we consider the disclosure date and the results of the first chronological event, which is DFAST

Table 1: Results announcement dates for stress tests conducted in Europe and in the United-States

Dates of stress tests results disclosure	
Europe	United-States
	May 07, 2009
July 23, 2010	
	March 18, 2011
July 15, 2011	
	March 13, 2012
	March 07, 2013
	March 20, 2014
October 26, 2014	
	March 05, 2015

3.3. Sample & Methodology

3.3.1. Bond ratings collection

To conduct this study, we collect data from Bloomberg database. For each stress test, we analyze the period of 127 days (six months) before and 127 days after the results disclosure. So, when we extract bonds from Bloomberg, we ensure to collect data of all bonds issued in the period between six month before the first stress test and six months after the last stress test in order to cover the whole period we study. As the European first stress test results are disclosed on July 23, 2010 and the last ones on October 26, 2014, we collect the ratings of bonds issued by European banks on the period between February 2010 and April 2015. In the case of the United-States, the first stress test results are released on May 07, 2009 and the last ones on March 05, 2015. We thus collect for US banks the ratings of bonds issued on the period between November 2008 and September 2015. We consider only bonds jointly rated by Moody's and Standard & Poor's. We also collect the maturity and the amount issued of each issue. The bonds' ratings collected are the initial ratings on each bond, so none observed disagreement is due simply to asynchronous changes in ratings over time. The letter ratings of the two agencies are mapped to a common numerical scale, with better letter ratings corresponding to lower numbers: Aaa = AAA = 1, Aa1 = AA+ = 2 … Caa3 = CCC- = 19. The global data set contains 4387 bonds issued by 98 European banks and 9559 bonds issued by 301 banks in the reported period. For each stress test, we keep only the bonds issued by banks participating to the stress exercise and jointly rated by Moody's and Standard & Poor's. Our sample includes 960 bonds issued by 38 European tested banks and 1932 bonds issued by 16 US tested banks.

The summarized statistics presented in Table 2 gives some insights on bonds' ratings and bonds' issue characteristics for European and US tested banks. Average ratings in our numerical scale tend to increase over the entire period meaning that the quality of bonds' ratings declines from 2009 to 2015[29]. Bonds maturities are longer in the US but amount issued are higher in Europe. There are fewer banks participating to the stress tests in the US but on average larger (all banks tested are Bank Holding Companies) than the banks involved in the European stress tests.

[29] We remind the lector that the notch scale is different from the category scale, see Table A1

Table 2: Moody's and S&P European and United-States banks' bonds rating and bonds characteristics, by issue period.

This table reports mean rating and characteristics of bonds issued by European banks and United-States tested banks around each stress test. Statistics are computed and reported on the 127-day-period before and 127-day period after each stress test results disclosure date. Issues/Issuers indicates respectively the number of bonds issued and the number of issuers on the period considered. Average rating is the average of Moody's and Standard & Poor's ratings, computed on a notch basis or on a category basis (higher value of Average rating indicates higher risk). Maturity is expressed in years. Amount issued is the total amount of the bond's issue.

Issue period	Issues/Issuers (number)	Average notch rating	Average category rating	Maturity (mean, years)	Amount issued
Europe					(mean, EUR millions)
Tested Banks - all sample period	**960/38**	**5.81**	**2.92**	**5.86**	**561.89**
127 days before the 2010 stress test	79/21	4.18	2.32	7.07	625.02
127 days after the 2010 stress test	88/21	4.22	2.37	5.41	647.68
127 days before the 2011 stress test	120/27	4.57	2.48	5.70	643.15
127 days after the 2011 stress test	40/19	5.50	2.79	5.66	399.87
127 days before the 2014 stress test	64/18	6.95	3.27	5.63	547.32
127 days after the 2014 stress test	60/18	7.49	3.53	5.77	666.80
United-States					(mean, USD millions)
Tested Banks - all sample period	**1932/16**	**6.28**	**3.08**	**9.41**	**429.67**
127 days before the 2009 stress test	39/10	1.87	1.40	3.93	1888.42
127 days after the 2009 stress test	62/10	5.50	2.91	6.46	752.24
127 days before the 2011 stress test	257/8	5.75	2.95	9.60	299.40
127 days after the 2011 stress test	200/7	5.77	2.95	11.35	266.51
127 days before the 2012 stress test	121/6	5.99	3.00	8.20	279.49
127 days after the 2012 stress test	105/6	6.47	3.11	8.42	259.57
127 days before the 2013 stress test	170/8	7.24	3.33	9.15	460.89
127 days after the 2013 stress test	154/9	7.13	3.29	9.86	266.83
127 days before the 2014 stress test	112/8	7.31	3.36	11.13	568.64
127 days after the 2014 stress test	127/9	7.41	3.42	10.69	514.09
127 days before the 2015 stress test	95/9	7.63	3.49	11.13	538.57
127 days after the 2015 stress test	72/8	7.08	3.31	9.03	990.51

3.3.2. Measures of rating disagreement

With ratings collected, we build different statistics measures of disagreement between the rating agencies, as the correlation between the ratings, the percentage of disagreement, the mean average absolute gap (defined as the mean of the absolute values of the rating differences between the two agencies) based on notch or category rating split. As noted in Bowe and Larik (2014), Moody's and Standard & Poor's introduced notch level ratings in 1982 and 1974, respectively. Notch ratings are given plus and minus symbols by Standard & Poor's, and numerical 1, 2, and 3 in the case of Moody's. Hence, for example using Standard & Poor's notation, a category level split differentiates AA from A but not AA+ from AA and a notch level split differentiates, for example, A from AA but also AA+ from AA. Table A1 in appendix presents the different ratings classes for Moody's and Standard & Poor's and the common numerical scale generally used in the literature.

3.3.3. Explanatory model of split ratings

To check how data disclosed in each stress test play a role in the banks' bonds split ratings, we run a linear model relating the rating absolute gap change to key data variables disclosed in the stress test results. For each stress test, the regression is run by considering the data available on the period of 127 days after the stress test results disclosure date. We adjust the rating absolute gap for a given bond of a given bank on the 127-day period after the disclosure by subtracting the mean of the rating absolute gap for of all the bonds issued by this bank on the 127-day period before the disclosure. Doing that, we construct an indicator of the impact of the test results on the variation of the rating gap, even if we have to consider a mean rating gap at the bank level before the disclosure, as we cannot associate with each bond issue "after" a similar bond issue "before". Stress test results[30] provide information about banks' credit exposure, banks' capital and banks' revenue on the financial market. For each stress test, we select the more representative variables of the disclosed results, those indicating the expected strengths or weaknesses of a bank. In the case of Europe, the key variables we considered are sovereign debt exposure, risk weighted assets, capital ratio and net income resulting from adverse scenario. The adverse scenario of the first stress test covers only one period (1 year), the second two periods (2 years) and the third three periods (3 years). The values of the stressed variables are disclosed for each period of the scenario. We choose to build the explanatory variables as the differences between the adverse scenario value and the current value published in the stress tests results. For each variable, we consider either the value on the first period or the value on the last period of the scenario. One can think that the resilience of a bank will be different on the first and on the last period of the scenario. The fact that we use the difference of the variables permits us to capture the actual impact of the stress test variables on the split rating. Even if the European stress tests met some critics from analysts, important information unknown before the first test, is the detailed banks' sovereign debt exposure. Because PIIGS[31] are the countries the most affected by the sovereign debt crisis, we consider in all stress tests only the banks' PIIGS countries exposure which is the riskier sovereign debt.

In the US case, the key variables we consider are the capital gap from SCAP, the total loan loss, the tier 1 capital, the leverage ratio and the net income. The US stress test adverse scenarios

[30] For European banks, we get the stress tests results from the website of European Bank Authority (https://www.eba.europa.eu/) while for US banks, the stress tests results are collected from the website of Federal Reserve (https://www.federalreserve.gov/)
[31] PIIGS is acronym for Portugal, Ireland, Italy, Greece and Spain.

have generally a time horizon of nine quarters but data are only available for the last period of the adverse scenarios. We then calculate the difference variables using the values on this last period of the adverse scenario (if available) and the current values published in the stress test results[32]. 7 banks of our sample failed the first US stress test. To control for this, we introduce a dummy variable *Failed_dummy* indicating if a bank failed or not the stress test. Nevertheless, no other bank has failed neither in other US tests nor in the EU tests. As in Morgan (2002), the regression controls also for the issue characteristics as the average rating of Moody's and Standard & Poor's for each bond, the maturity of bond and the logarithm of bond's amount issued both for European and US banks. The estimated model is the following:

$$\Delta Gap\_k_{i,j} = \alpha_k + \beta_k Bank\_stress\_results_j + \gamma_k Bond\_controls_i + \varepsilon_{k,i,j} \quad (1)$$

where $\Delta Gap\_k_{i,j}$ is the difference between the rating absolute gap of the bond i issued by the bank j on the 127-day period after a stress test results disclosure and the mean of the rating absolute gap of all bonds issued by the bank j on the 127_day period before this stress test results disclosure, the gap being measured at the notch level for k=1 and at the category level for k =2. $Bank\_stress\_results_j$ is a vector of variables built from the stress tests results disclosed for the bank j, $Controls_i$ is a vector of characteristics related to the issue of bond i, ε is the error term. The controls variables are defined in Table 3.

Table 3: Explanatory variable definitions

PIIGS exposure	PIIGS[33] countries sovereign debt exposure from the EBA stress test results disclosure for a specific bank divided by the Tier 1 capital for the 2010 stress test and divided by Core tier 1 capital for the 2011 and 2014 stress test.
ΔRWA	Difference between the risk weighted assets from adverse scenario of the EBA stress test divided and the actual risk weighted assets divided by total assets.
Δ(C)Tier1	Difference between the tier 1 ratio in the case of the 2010 stress test and Core tier 1 ratio for the 2010 and 2011 stress test from adverse scenario of the EBA stress test and the actual tier 1 (Core tier 1) capital ratio.
ΔNet Income	Difference between the net income from adverse scenario of the EBA stress test results disclosure and the actual net income divided by total assets.
Gap_to_Asset	Capital GAP from 2009 US stress test results disclosure on 07/05/2009 for a specific bank divided by the total assets.
ΔTier1	Difference between the tier 1 capital ratio from the adverse scenario of the US stress test and the actual tier 1 capital ratio.
ΔLeverage	Difference between the leverage ratio from the adverse scenario of the US stress test and the actual leverage ratio.
Net income	Net income ratio over the period of the stress test adverse scenario of the US stress test.
Total_loss_loan	Loan losses over the periods of the adverse scenario of US stress test divided by total loans.
Failed_dummy	Dummy variable equals to 1 when the bank failed to the stress test and equals to 0 otherwise.
Average_rating	Average notch rating of the Moody's and S&P bonds issue rating
Ln_amount_issued	Logarithm of bond issue amount
Maturity	Bond maturity in years

[32] The results data of the second US stress tests conducted in 2011 were not released by Federal Reserve. Thus in the regression we do not consider the 2011 stress test.
[33] PIIGS is an acronym used to refer to the five countries : Portugal, Ireland, Italy, Greece and Spain

3.4. Results

Literature on information disclosure effects provides mixed results. Stress testing exercises provide a natural experiment that we exploit to focus on the impacts on bond split ratings. We first identify how the disagreement between rating agencies evolves, before and after the stress test results. The statistical analysis confirms that stress tests rarely lead to a greater convergence of views of agencies in the short term, some measures of disagreement showing even the opposite effect. We then investigate how these evolutions are linked to the nature of information disclosed about key variables of stressed bank performance and risk.

3.4.1. Highlighting the impact of stress tests on split rating

Table 4 presents various measures of disagreements as the average rating by rating agency, the correlation between the two ratings, the percentage of disagreement and the average absolute gap between the ratings of Moody's and Standard & Poor's for each period of 127 days before and after each EU and US banks stress test. Furthermore, we break down the percentage of disagreements according to the extent of the split rating, difference of 1 degree (GAP=1), 2 degrees (GAP=2), 3 degrees or more (GAP=3+), for both notch and category ratings[34]. Higher correlation between the ratings of the two agencies may indicate convergence of their appraisal (usually but not necessarily less split rating).[35] The correlation, either notch or category rating, is always weaker after the stress test disclosure for European bonds but this finding only applies to half of the US tests. The percentage of disagreement is high both for European and US banks. This measure shows a higher disagreement after the stress tests in one out of three tests (notch) or two out of three tests (category) for European bonds and a perfectly balanced outcome for US bonds. It is worth noting that the average absolute gap gives quite the same insights for both European and US cases. Examining the rating gap distribution, the proportion of the largest gaps (3 + for notch rating or 2 for category rating), is consistently higher after the European stress tests than before. However, in the US case, this increased disagreement is observed only for the largest notch gaps (2 notches differentials) and only in half of the tests.

[34] These gaps are built in absolute values. For a given difference of ratings (numerical values) a gap is the same regardless of the agency that gave the highest rating.

[35] If the two agencies do not refer to the same scale because one is more conservative than the other, and systematically gives a rating one notch (or category) under the other, we should observe a perfect correlation and a full disagreement. It is obviously an extreme hypothesis not verified in our sample, but we can observe some disagreements between these two measures of disagreement

Table 4: Measures of disagreement between Moody's and S&P for European and United-States banks' bonds ratings.

This table reports different bonds disagreement measures between Moody's and Standard & Poor's. Correlation is the correlation index between their ratings. Moody's <> S&P indicates the percentage of their disagreements .Absolute gap is the absolute difference between Moody's and Standard & Poor's ratings. Rating gap distribution represents the percentage of Gap= 1, Gap= 2 or Gap = 3 and more in the total number of disagreements.

	Average ratings				Rating gap distribution (%)		
Issue period	(Moody's/S&P)	Correlation between ratings	Moody's <> S&P (%)	Average absolute gap	Gap=1	Gap=2	Gap=3+
Europe							
			Notch rating				
Tested Banks - all sample period	**5.69/5.92**	**0.85**	**57.8**	**0.89**	**66.3**	**23.2**	**10.5**
127 days before the 2010 stress test	3.59/4.76	0.69	79.7	1.42	49.2	39.7	11.1
127 days after the 2010 stress test	3.53/4.91	0.63	77.3	1.60	35.3	47.1	17.6
127 days before the 2011 stress test	4.16/4.98	0.73	58.3	1.09	48.6	31.4	20.0
127 days after the 2011 stress test	5.2/5.8	0.61	45.0	1.05	61.1	0.0	38.9
127 days before the 2014 stress test	7.13/6.77	0.97	34.4	0.45	68.2	31.8	0.0
127 days after the 2014 stress test	7.53/7.45	0.91	56.7	0.75	79.4	11.8	8.8
			Category rating				
Tested Banks - all sample period	**2.87/2.96**	**0.79**	**27.1**	**0.30**	**90.4**	**9.6**	**0.0**
127 days before the 2010 stress test	2.11/2.52	0.60	43.0	0.48	88.2	11.8	0.0
127 days after the 2010 stress test	2.14/2.6	0.55	50.0	0.58	84.1	15.9	0.0
127 days before the 2011 stress test	2.36/2.61	0.64	31.7	0.37	84.2	15.8	0.0
127 days after the 2011 stress test	2.67/2.9	0.59	22.5	0.32	55.6	44.4	0.0
127 days before the 2014 stress test	3.34/3.19	0.89	18.8	0.19	100.0	0.0	0.0
127 days after the 2014 stress test	3.53/3.53	0.80	26.7	0.27	100.0	0.0	0.0
United-States							
			Notch rating				
Tested Banks - all sample period	**6.29/6.28**	**0.79**	**69.7**	**0.88**	**73.6**	**26.0**	**0.4**
127 days before the 2009 stress test	1.79/1.95	0.99	15.4	0.15	100.0	0.0	0.0
127 days after the 2009 stress test	5.21/5.79	0.86	64.5	0.65	100.0	0.0	0.0
127 days before the 2011 stress test	5.42/6.08	0.73	65.8	0.77	82.2	17.8	0.0
127 days after the 2011 stress test	5.53/6.02	0.74	79.5	0.98	77.4	22.6	0.0
127 days before the 2012 stress test	5.68/6.31	0.35	93.4	1.42	47.8	52.2	0.0
127 days after the 2012 stress test	6.19/6.75	0.57	83.8	1.29	46.6	53.4	0.0
127 days before the 2013 stress test	7.5/6.98	0.86	57.6	0.64	89.8	10.2	0.0
127 days after the 2013 stress test	7.36/6.9	0.88	51.3	0.55	93.7	6.3	0.0
127 days before the 2014 stress test	7.86/6.76	0.90	87.5	1.12	72.4	27.6	0.0
127 days after the 2014 stress test	8.13/6.69	0.86	98.4	1.47	50.4	49.6	0.0
127 days before the 2015 stress test	8.37/6.88	0.96	98.9	1.48	50.0	50.0	0.0
127 days after the 2015 stress test	7.56/6.6	0.85	72.2	0.96	67.3	32.7	0.0
			Category rating				
Tested Banks - all sample period	**3.16/2.99**	**0.63**	**31.6**	**0.32**	**100.0**	**0.0**	**0.0**
127 days before the 2009 stress test	1.38/1.41	0.98	2.6	0.03	100.0	0.0	0.0
127 days after the 2009 stress test	2.87/2.95	0.64	14.5	0.15	100.0	0.0	0.0
127 days before the 2011 stress test	2.89/3.01	0.47	18.3	0.18	100.0	0.0	0.0
127 days after the 2011 stress test	2.96/2.95	0.58	26.0	0.26	100.0	0.0	0.0
127 days before the 2012 stress test	3.03/2.97	0.37	29.8	0.30	100.0	0.0	0.0
127 days after the 2012 stress test	3.17/3.06	0.70	17.1	0.17	100.0	0.0	0.0
127 days before the 2013 stress test	3.52/3.14	0.50	47.6	0.48	100.0	0.0	0.0
127 days after the 2013 stress test	3.48/3.1	0.57	40.3	0.40	100.0	0.0	0.0
127 days before the 2014 stress test	3.63/3.08	0.61	55.4	0.55	100.0	0.0	0.0
127 days after the 2014 stress test	3.76/3.08	0.16	68.5	0.69	100.0	0.0	0.0
127 days before the 2015 stress test	3.87/3.11	0.71	76.8	0.77	100.0	0.0	0.0
127 days after the 2015 stress test	3.51/3.1	0.32	41.7	0.42	100.0	0.0	0.0

Looking at the successive tests, we can clearly identify the first European (2010) and two first American (2009, 2011) tests, those following the global financial crisis, and the 2014 tests both in EU and the US, as those that best correspond to a counterintuitive and maybe counterproductive impact of information disclosure since they reveal a higher divergence of the two rating agencies in the post stress test periods. However, these short-term impacts should not hide the fact that on the whole period of European stress tests, there is a convergence trend in the opinions of rating agencies, whatever the measures selected. Even if it does not necessarily mean a favorable long-term impact of repeated stress tests insofar as many other parameters can explain a decrease of the European banking sector uncertainty in a less troubled period after the Global Financial Crisis and the Debt Crisis, we cannot dismiss this possibility. Nonetheless, this is not a trend observed over the period of the six US stress tests.[36]

In order to avoid a possible selection bias related to the fact that some banks should decide to issue bonds either before or after the stress test results (according to their expectations of their own results), we now focus on split rating measures built on a restricted sample where we retain for each test only banks having issues both on the periods of 127 days before and 127 days after the results disclosure. Table A2 and table A3 provide the measures of disagreement relative to this restrained sample of same bank bonds issues around each test. We can draw conclusions very similar to those obtained in the overall sample as most measures give the same indications. Indeed, regardless of the sample we use, we find the same tests leading to a substantial increase in the divergence between Moody's and S&P ratings, i.e. 2010 and 2014 EU stress tests, 2009, 2011 and 2014 US stress tests[37].

In Table 5 and table 6, we present more detailed information on an individual basis and tabulate the average absolute gap for each bank of the restricted sample respectively for Europe and for the US. For each bank, we compute the mean rating absolute gap (for both notch and category splits) for all the bonds issued by this bank both before and after the stress test disclosure.

[36] The overall mean average absolute gap is quite the same for UE and US bank bonds (around 0.9 for the notch rating, 0.3 for the category rating) but the time profile is very different, a downward trend in Europe, a high volatility in the US. Furthermore, in the US case, there is virtually no Gap 3+ for notch rating and only GAP 1 for category rating.

[37] We present in Appendix A4 to A7 the measures of split rating disagreements between Moody's and Fitch and also between Fitch and Standard & Poor's. Findings are quite similar as in the case of the disagreements between Moody's and Standard & Poor's.

Table 5: European banks' bond rating absolute gap: mean on the 127-day period before, mean on the 127-day period after stress test disclosure and difference between the mean after and the mean before.

This table reports the mean absolute rating gap between Moody's and Standard & Poor's for each bank on the 127-day-period before and 127-day period after each stress test results disclosure date. The table reports also the difference of the mean after and the mean before the stress test.

Bank	Notch rating absolute gap						Category rating absolute gap					
	Before		After		difference mean after - mean before		Before		After		difference mean after - mean before	
	Obs.	Mean	Obs.	Mean	Negative	Positive	Obs.	Mean	Obs.	Mean	Negative	Positive
EU 2010 stress test												
BBVA SA	1	0	4	6		6	1	0	4	2		2
Banco BPI SA	1	5	1	0	-5		1	1	1	0	-1	
Banco Popolare SC	2	1	3	0.67	-0.33		2	0.5	3	0.33	-0.17	
Banco Popular Espanol SA	1	0	2	0		0	1	0	2	0		0
Bank of Ireland	10	1.6	8	1.63		0.02	10	0.5	8	0.5		0
Bankia SA	4	2.5	2	2	-0.5		4	1	2	0.5	-0.5	
Bankinter SA	2	3	3	3.67		0.67	2	1	3	1.33		0.33
BNP Paribas SA	2	0	6	0		0	2	0	6	0		0
Commerzbank AG	8	2	8	1.5	-0.5		8	1	8	0.75	-0.25	
Danske Bank A/S	8	0.75	2	0	-0.75		8	0.38	2	0	-0.38	
Intesa Sanpaolo SpA	9	1.33	6	2.83		1.5	9	0.22	6	1		0.78
Nordea Bank AB	5	1.2	10	1	-0.2		5	0.2	10	0.1	-0.1	
Pohjola Bank PLC	1	1	2	1		0	1	0	2	0		0
Societe Generale SA	4	2	17	2		0	4	1	17	1		0
Swedbank AB	4	0	1	0		0	4	0	1	0		0
UniCredit Bank AG	2	1.5	6	0.5	-1		2	0.5	6	0.17	-0.33	
Mean					**-0.01**						**0.02**	
EU 2011 stress test												
BBVA SA	2	6	1	0	-6		2	2	1	0	-2	
Banco BPI SA	1	3	1	5		2	1	1	1	1		0
Banco Popolare SC	3	0.67	1	0	-0.67		3	0.33	1	0	-0.33	
Bankinter SA	1	5	3	5		0	1	2	3	2		0
BNP Paribas SA	11	0	1	0		0	11	0	1	0		0
Commerzbank AG	21	0.29	11	0	-0.29		21	0.1	11	0	-0.1	
Credit Agricole SA	2	2.5	1	3		0.5	2	0.5	1	1		0.5
HSBC Holdings PLC	2	1	2	1		0	2	0	2	0		0
Intesa Sanpaolo SpA	13	2.46	4	0	-2.46		13	1	4	0	-1	
Nordea Bank AB	6	1	1	1		0	6	0.33	1	0	-0.33	
Pohjola Bank PLC	2	1	1	1		0	2	0.5	1	1		0.5
Skandinaviska Enskilda Banken AB	2	1	1	5		4	2	0	1	2		2
Svenska Handelsbanken AB	3	1	1	1		0	3	0	1	0		0
Swedbank AB	8	0	4	0.5		0.5	8	0	4	0		0
UniCredit Bank AG	7	0.86	2	0.5	-0.36		7	0.29	2	0	-0.29	
Unione di Banche Italiane SpA	4	1	1	0	-1		4	0	1	0		0
Mean					**-0.24**						**-0.07**	
EU 2014 stress test												
Bank of Ireland	1	2	1	0	-2		1	0	1	0		0
Bankia SA	3	1	1	4		3	3	0	1	1		1
Bankinter SA	2	1.5	2	3		1.5	2	0.5	2	1		0.5
Barclays PLC	2	0.5	3	1.33		0.83	2	0.5	3	0.67		0.17
BNP Paribas SA	9	0	6	0		0	9	0	6	0		0
Commerzbank AG	3	1	3	1		0	3	1	3	1		0
Danske Bank A/S	4	2	2	1	-1		4	1	2	0.5	-0.5	
Deutsche Bank AG	4	0.75	4	1		0.25	4	0	4	0.5		0.5
Intesa Sanpaolo SpA	6	0.5	5	1		0.5	6	0.5	5	0	-0.5	
Nordea Bank AB	3	0	1	0		0	3	0	1	0		0
Raiffeisen Bank International AG	3	0	1	2		2	3	0	1	1		1
Societe Generale SA	6	0	3	0.67		0.67	6	0	3	0		0
Swedbank AB	4	0	12	0.25		0.25	4	0	12	0.25		0.25
UniCredit Bank AG	2	0	2	0.5		0.5	2	0	2	0		0
Mean					**0.46**						**0.17**	

Table 6: US banks' bond rating absolute gap: mean on the 127 day-period before, on the 127 day-period after stress test disclosure and difference between the mean after and the mean before.

This table reports the mean absolute rating gap between Moody's and Standard & Poor's for each bank on the 127-day-period before and 127-day period after each stress test results disclosure date. The table reports also the difference of the mean after and the mean before the stress test.

Bank	Notch rating absolute gap						Category rating absolute gap					
	Before		After		difference mean after - mean before		Before		After		difference mean after - mean before	
	Obs.	Mean	Obs.	Mean	Negative	Positive	Obs.	Mean	Obs.	Mean	Negative	Positive
US 2009 stress test												
Bank of America Corp	3	0	15	0		0	15	0	3	0		0
BB&T Corp	2	0	3	1		1	3	0	2	0		0
Goldman Sachs Group Inc/The	11	0.45	27	1		0.55	27	0	11	0		0
JPMorgan Chase & Co	8	0.13	2	1		0.88	2	1	8	0.13		0.88
Morgan Stanley	7	0	4	0.25		0.25	4	0	7	0		0
State Street Corp	2	0	2	0		0	2	0	2	0		0
US Bancorp/MN	2	0	3	0.67		0.67	3	0.67	2	0		0.67
Wells Fargo & Co	2	0	2	1		1	2	1	2	0		1
Mean						**0.54**						**0.32**
US 2011 stress test												
Ally Financial Inc	10	1	4	0.75	-0.25		4	0	10	0		0
Bank of America Corp	70	0	20	0.2		0.2	20	0.1	70	0		0.1
Goldman Sachs Group Inc/The	90	1	80	1		0	80	0	90	0		0
JPMorgan Chase & Co	35	1.6	25	1.56	-0.04		25	1	35	1		0
Morgan Stanley	43	0.7	46	0.54	-0.15		46	0.02	43	0		0.02
Wells Fargo & Co	8	1.75	24	1.83		0.08	24	1	8	1		0
Mean						**-0.03**						**0.02**
US 2012 stress test												
Ally Financial Inc	1	0	2	0		0	2	0	1	0		0
Bank of America Corp	14	1.57	7	1.86		0.29	7	1	14	1		0
Goldman Sachs Group Inc/The	49	1.67	51	1.49	-0.18		51	0	49	0		0
JPMorgan Chase & Co	14	1.79	6	1	-0.79		6	0.5	14	1	-0.5	
Morgan Stanley	25	0.72	23	1		0.28	23	0.35	25	0.04		0.31
Wells Fargo & Co	18	1.39	17	1	-0.39		17	0	18	0.39	-0.39	
Mean						**-0.13**						**-0.1**
US 2013 stress test												
Ally Financial Inc	4	0	3	0		0	3	0	4	0		0
American Express Co	8	1	2	1		0	2	1	8	1		0
Bank of America Corp	10	2	5	2		0	5	1	10	1		0
Goldman Sachs Group Inc/The	51	0	48	0.04		0.04	48	0.04	51	0		0.04
JPMorgan Chase & Co	17	0	23	0.04		0.04	23	0	17	0		0
Morgan Stanley	64	1	54	1		0	54	0.98	64	0.98		0
SunTrust Banks Inc	2	1	4	1		0	4	0	2	0		0
Wells Fargo & Co	14	1	11	1		0	11	0	14	0		0
Mean						**0.01**						**0.01**
US 2014 stress test												
Bank of America Corp	8	2	26	2		0	26	0.96	8	1	-0.04	
Goldman Sachs Group Inc/The	39	0.79	29	1		0.21	29	1	39	0.79		0.21
JPMorgan Chase & Co	18	0.89	9	1		0.11	9	0.22	18	0		0.22
Morgan Stanley	22	1.77	20	2		0.23	20	0.95	22	0.95		0
SunTrust Banks Inc	1	1	2	1		0	2	0	1	0		0
Wells Fargo & Co	20	0.9	15	1		0.1	15	0	20	0		0
Mean						**0.11**						**0.06**
US 2015 stress test												
Bank of America Corp	14	2	7	1.71	-0.29		7	0.71	14	0.86	-0.14	
Citigroup Inc	11	2	13	1.62	-0.38		13	0.77	11	1	-0.23	
Goldman Sachs Group Inc/The	27	1	16	0.75	-0.25		16	0.69	27	1	-0.31	
HSBC USA Inc	6	1	8	0	-1		8	0	6	0		0
JPMorgan Chase & Co	6	1	2	1		0	2	0.5	6	0.17		0.33
Morgan Stanley	18	2	12	0.67	-1.33		12	0.25	18	1	-0.75	
State Street Corp	1	0	3	1		1	3	0	1	0		0
Wells Fargo & Co	8	1	11	1		0	11	0	8	0		0
Mean						**-0.28**						**-0.14**

A majority of banks have split rating different from zero on both periods. We then do the difference of these two mean rating absolute gaps (mean after minus mean before) to identify which banks experiment an increase (positive differential) or a decrease (negative differential) in the disagreement on their bonds on the period after the disclosure of the stress test. For most of the European banks, these mean differences are negative on the two first tests but positive on the 2014 test. For US banks, these differences are generally lower compared to European banks, and putting the focus only on the most settled cases, mostly negative for the 2015 test but mostly positive for the 2009, 2011 and 2014 tests.

We also provide mean difference tests at bond level (table 7) and bank level (table 8). Differences appear globally not significant for European bonds except for a positive and significant (5% level) difference for the 2014 test (notch gap). For US bonds, differences are positive and significant for the 2009, 2011 and 2014 tests (with a higher significance for notch gaps (1% level) than category gaps (5% level)). Looking at the bank level[38], we do not find any significance for any European test, but a positive and significant difference both for the 2009 and the 2014 tests when rating gaps are computed on the notch basis (with a higher significance in 2014 (1% level) than in 2009 (5%)). Overall, it has to be said that there is only one result of these difference tests showing the generally expected favorable effect of stress test disclosure as we find a negative and significant (1% level) decrease of disagreement between Moody's and S&P ratings only once, for the last 2015 US test and only at the bond level (both for notch and category ratings).

Table 7: Mean difference tests for rating absolute rating gap at bond level on the periods before and after stress test for Europe and United-States banks' bonds.

	Mean difference test: 127 days after - 127 days before		Mean difference test: 127 days after - 127 days before	
	Bond notch rating absolute gap	P-value	Bond category rating absolute gap	P-value
EUROPE				
2010 stress test	0.19	0.38	0.1	0.31
2011 stress test	-0.042	0.87	-0.04	0.7
2014 stress test	0.3**	0.04	0.08	0.3
UNITED-STATES				
2009 stress test	0.49***	0.00	0.12**	0.05
2011 stress test	0.2***	0.00	0.08**	0.05
2012 stress test	-0.14	0.13	-0.13**	0.03
2013 stress test	-0.09	0.16	-0.07	0.91
2014 stress test	0.36***	0.00	0.13**	0.02
2015 stress test	-0.53***	0.00	-0.35***	0.00

[38] We can now run paired difference tests.

Table 8: Mean difference test for rating absolute gap at bank level on the periods before and after stress test for Europe and United-States banks' bonds.

		mean difference test: 127 days after - 127 days before			
	Obs.	Notch rating absolute gap	P-val	Category rating absolute gap	P-val
EUROPE					
2010 stress test	16	-0.006	0.99	0.024	0.9
2011 stress test	16	-0.24	0.65	-0.07	0.8
2014 stress test	14	0.46	0.17	0.17	0.28
UNITED-STATES					
2009 stress test	8	0.54***	0.01	0.32*	0.08
2011 stress test	6	-0.027	0.7	0.02	0.95
2012 stress test	6	-0.13	0.47	-0.097	0.71
2013 stress test	8	0.011	0.17	0.005	0.99
2014 stress test	6	0.11**	0.04	0.06	0.83
2015 stress test	8	-0.28	0.29	-0.14	0.53

The mean difference test reported is paired. We have the same issuer of banks during the period before and after the stress test but the number of issue is different. To get paired sample, we did the mean of the rating absolute gap of each individual bank in each period before and after the
stress test.

According to all our different measures of disagreement (correlation, rating absolute gap, percentage of disagreement), we can postulate that the second 2011 Europe stress test shows a higher decrease in disagreements after the disclosure while, on the whole, it is the opposite after the results publication of the first 2010 and the third 2014 stress test. The first European banks stress test being disclosed in 2010, this period represents the beginning of the European sovereign debt crisis. There was an increasing of uncertainty about banks' exposure to the sovereign debt. The risk of Greece bankruptcy caused also higher financial distress. The turmoil brought by the sovereign debt crisis may explain the increase of split rating after the first European stress test disclosure. Compared to the first stress test, the second European stress test conducted in 2011 has more detailed data disclosed and the scenarios are improved in response to the critics addressed to the 2010 stress tests This may explain the decrease of split rating percentage observed during the period after this second stress test (Table 4). This confirms also that, as highlighted in previous studies, the opacity decreased after the 2011 stress test and the market reacted in this sense. Furthermore, Goldstein and Sapra (2013), Schuermann (2013) support the fact that the disclosure is more beneficial during crisis period when the financial market has a high information need. The third European stress test whose results are disclosed on October 26, 2014, is conducted both by the EBA and the ECB. The novelty in this 2014 stress test is the fact that before the stress test realization, the ECB conducted an assets quality review in the context of the implementation of the single supervisory mechanism. Ong and Pazarbasioglu (2014) argue that additional steps to stress test such as asset quality review

comprising audits and expert valuations of banks portfolios are crucial for an effective and credible stress test. Even if on the period, the rating divergence seems to increase after the third European stress test, most of splits are only single notch or single category differentials, reflecting the previously mentioned long-term trend of diminishing opacity despite the short-term opposite effect.

In the US, our measures provide mixed results across the successive tests, alternating positive and negative effects of stress test results disclosure on disagreement between the two rating agencies. A possible explanation of the decrease in the percentage of disagreement after the 2012 third and 2013 fourth stress tests (Table 4) may be put forward in connection with the changing pattern of the US stress tests that become more severe, comprehensive and rigorous compared to the previous ones. At the fourth stress test, it is also the first time that both CCAR and DFAST are conducted at the same time by the Federal Reserve. The decrease of disagreement may be explained by these new resolutions taken.

Overall, our findings suggest that the impact of stress test results disclosure is mixed both for US and European bank bond split rating, but underline many episodes where information disclosure increases the immediate disagreement between rating agencies. To go further in the analysis, we then try to identify which results disclosed after each stress test are more likely to explain the evolution of split ratings before and after the disclosure in order to understand which information could lead to a convergence and which information could lead to a divergence between Moody's and S&P ratings, and this, in all cases or only for some specific tests in Europe or the US.

3.4.2. Identifying relevant stress test variables in the explanation of split rating changes

We select the rating absolute gap change (ΔGap) as a specific and tractable measure of disagreement evolution between rating agencies. We then regress this measure over some specific variables extracted from the disclosed results of each stress test. The econometric model (equation 1) is very simple and allows us to determine which results might explain the observed changes in split rating in pre/post disclosure periods. Table 9 (Europe) and Table 10 (US) present statistics of independent and explanatory variables of the model. Table 11 gather the results for European tests and Table 12 for US tests.

Table 9: Statistics of dependent and explanatory variables on the 127-day period after each stress test results disclosure, European banks.

For each bond issued on the 127-day period after the stress test disclosure, ΔGap1 is the difference between its notch rating absolute gap and the mean notch rating absolute gap computed for all bonds of the same issuing bank issued on the 127 day-period before the stress test disclosure date. ΔGap2 is the same indicator built for category rating. The rating absolute gap is the absolute difference between Moody's and Standard & Poor's bonds' ratings. PIIGS exposure is the PIIGS countries sovereign debt exposure of a bank(disclosed in the EBA stress test results), divided by its Tier 1 capital for the 2010 stress test and Core Tier 1 capital for the 2011 and 2014 stress tests. Δ(C)Tier1 is the difference between the stressed value (on the first or on the last period of the adverse scenario) of the Tier 1 ratio in the case of the 2010 stress test or the Core Tier 1 ratio for the 2011 and 2014 stress tests t and the current Tier 1 (Core tier 1) capital ratio. ΔRWA is the difference between the stressed risk weighted assets (on the first or on the last period of the adverse scenario) and the current risk weighted assets divided by total assets. ΔNet Income is the difference between the stressed net income (on the first or on the last period of the adverse scenario) and the current net income divided by total assets. Controls stands for the following variables: Average_rating,, Ln_amount_issued EUR), Maturity (see table 3).

		ΔGap1	ΔGap2	PIIGS exposure	Δ(C)Tier1		ΔRWA		ΔNet Income		Average_rating	Ln_amount_issued	Maturity
EU 2010	Obs.	71	71	71	71		71				71	71	71
Stress test	Mean	0.218	0.090	0.636	-0.003		0.027				3.965	19.628	5.540
	Median	0.000	0.000	0.321	-0.004		0.031				4.000	20.314	4.999
	Maximum	6.000	2.000	2.833	0.018		0.063				10.000	21.701	14.995
	Minimum	-5.000	-1.000	0.000	-0.016		-0.009				1.000	15.425	1.251
	Std. Dev.	1.732	0.639	0.780	0.006		0.013				1.527	1.454	2.935
					First period	*Last period*	*First period*	*Last period*	*First period*	*Last period*			
EU 2011	Obs.	36	36	36	36	36	36	36	36	36	36	36	36
Stress test	Mean	-0.357	-0.147	1.013	-0.009	0.011	0.039	-0.056	-0.004	0.004	5.306	18.296	5.932
	Median	-0.286	-0.095	0.741	-0.005	0.009	0.036	-0.047	-0.004	0.003	6.000	17.956	4.463
	Maximum	4.000	2.000	2.567	0.007	0.025	0.099	0.008	-0.001	0.008	10.000	21.416	30.160
	Minimum	-6.000	-2.000	0.000	-0.022	-0.012	-0.003	-0.130	-0.006	0.002	1.000	14.914	1.500
	Std. Dev.	1.521	0.591	0.876	0.010	0.013	0.030	0.045	0.002	0.002	1.614	1.855	5.570
EU 2014	Obs.	44	44	44	44	44	44	44	44	44	44	44	44
Stress test	Mean	0.341	0.091	11.910	0.013	0.025	-0.025	-0.034	0.001	0.001	6.750	19.565	5.657
	Median	0.000	0.000	0.298	0.011	0.025	-0.018	-0.029	0.003	0.002	6.250	19.811	4.999
	Maximum	2.000	1.000	54.537	0.024	0.045	-0.004	-0.007	0.007	0.005	10.500	21.416	12.006
	Minimum	-2.000	-1.000	0.000	0.006	0.007	-0.048	-0.073	-0.014	-0.016	4.000	17.034	1.213
	Std. Dev.	0.676	0.461	18.622	0.005	0.009	0.013	0.018	0.004	0.005	2.059	1.476	3.046

Table 10: Statistics of dependent and explanatory variables on the 127-days period after each stress test results disclosure, United-States banks.

For each bond issued on the 127-day period after the stress test disclosure, ΔGap1 is the difference between its notch rating absolute gap and the mean notch rating absolute gap computed for all bonds of the same issuing bank issued on the 127 day-period before the stress test disclosure date. ΔGap2 is the same indicator built for category rating. The rating absolute gap is the absolute difference between Moody's and Standard & Poor's bonds' ratings.. GAP_to_Assets is capital GAP from 2009 US stress test results for a specific bank divided by its total assets. . ΔTier1 is the difference between the Tier 1 capital ratio from the adverse scenario of the US stress test and the current tier 1 capital ratio. Net income is the net income rate over the period of the stress test adverse scenario of the US stress test. Total_loss_loan is the losses on total loans over the periods of the adverse scenario of US stress test divided by total loans. ΔLeverage is the difference between the leverage ratio from the adverse scenario of the US stress test and the current leverage ratio. Failed_dummy is a dummy variable equals to 1 when the bank failed the stress test and equals to 0 otherwise. Controls stands for the following variables: Average_rating, Ln_amount_issued (USD), Maturity (see table 3).

		ΔGap1	ΔGap2	Gap_to_Asset	ΔTier1(%)	ΔLeverage (%)	Total_loss_loan (%)	Net income (%)	Average_rating	Ln_amount_issued	Maturity
2009 US Stress test	Obs.	55	55	55			55		55	55	55
	Mean	0.409	0.068	0.458			4.5		5.591	18.327	6.550
	Median	0.545	0.000	0.000			0.9		5.500	17.439	6.031
	Maximum	1.000	1.000	1.460			10		6.500	21.956	10.010
	Minimum	0.000	0.000	0.000			0.4		4.500	13.816	1.999
	Std. Dev.	0.344	0.246	0.653			4.3		0.420	2.133	2.015
2012 US Stress test	Obs.	105	105		105		105	105	105	105	105
	Mean	-0.101	-0.024		-4.247		3.186	-5.164	6.471	17.099	8.422
	Median	0.280	0.000		-4.400		1.600	-2.600	6.000	16.530	6.015
	Maximum	0.429	0.960		-2.500		8.300	-2.500	14.000	21.640	29.999
	Minimum	-1.786	-1.000		-4.900		0.900	-15.000	5.000	14.771	1.999
	Std. Dev.	0.708	0.352		0.825		3.214	4.677	1.286	1.895	6.546
2013 US Stress test	Obs.	150	150		150	150	150	150	150	150	150
	Mean	0.020	0.012		-5.384	-1.999	5.135	-2.457	7.173	16.423	9.920
	Median	0.000	0.000		-4.900	-2.100	5.200	-2.400	7.000	15.734	9.473
	Maximum	1.000	1.000		-1.400	-1.200	11.200	0.600	14.000	21.640	29.985
	Minimum	0.000	-0.984		-7.500	-2.400	3.100	-7.100	5.500	12.780	1.500
	Std. Dev.	0.140	0.141		1.764	0.325	1.856	0.911	1.204	2.468	6.377
2014 US Stress test	Obs.	101	101		101	101	101	101	101	101	101
	Mean	0.129	0.068		-4.451	-2.811	4.729	-2.047	7.411	17.420	11.068
	Median	0.111	0.000		-5.000	-2.700	4.600	-2.300	7.500	16.338	10.001
	Maximum	0.227	1.000		-0.900	-1.700	7.300	-0.700	9.000	21.822	30.001
	Minimum	0.000	-1.000		-5.100	-3.400	3.000	-2.500	5.500	13.891	2.998
	Std. Dev.	0.092	0.217		1.086	0.392	1.704	0.473	0.898	2.577	6.850
2015 US Stress test	Obs.	72	72		72	72	72	72	72	72	72
	Mean	-0.444	-0.241		-4.690	-3.279	5.311	-2.196	7.076	19.459	9.034
	Median	0.000	0.000		-5.200	-3.200	4.900	-2.500	7.500	20.419	5.002
	Maximum	1.000	0.833		0.400	-1.000	8.600	1.200	9.000	21.976	30.010
	Minimum	-2.000	-1.000		-6.200	-4.300	3.200	-3.100	5.500	13.629	1.996
	Std. Dev.	0.748	0.461		1.428	0.667	1.851	0.846	1.057	2.303	7.690

Table 11: Linear regression for Europe banks sample

For each bond issued on the 127-day period after the stress test disclosure, ΔGap1 is the difference between its notch rating absolute gap and the mean notch rating absolute gap computed for all bonds of the same issuing bank issued on the 127 day-period before the stress test disclosure date. ΔGap2 is the same indicator built for category rating. The rating absolute gap is the absolute difference between Moody's and Standard & Poor's bonds' ratings. PIIGS exposure is the PIIGS countries sovereign debt exposure of a bank(disclosed in the EBA stress test results), divided by its Tier 1 capital for the 2010 stress test and Core Tier 1 capital for the 2011 and 2014 stress tests. Δ(C)Tier1 is the difference between the stressed value of the Tier 1 ratio in the case of the 2010 stress test or the Core Tier 1 ratio for the 2011 and 2014 stress tests t and the current Tier 1 (Core tier 1) capital ratio. ΔRWA is the difference between the stressed risk weighted assets and the current risk weighted assets divided by total assets. ΔNet Income is the difference between the stressed net income and the current net income divided by total assets. Controls stands for the following variables: Average_rating,, Ln_amount_issued (iEUR), Maturity (see table 2).

First period

	EU 2010				EU 2011				EU 2014			
VARIABLES	ΔGap1	ΔGap2	ΔGap1	ΔGap2	ΔGap1	ΔGap2	ΔGap1	ΔGap2	ΔGap1	ΔGap2	ΔGap1	ΔGap2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
PIIGS exposure	1.271***	0.523***	1.062***	0.435***	-0.900***	-0.371***	-0.772**	-0.351***	-0.00418	-0.00836***	0.00359	-0.00680*
	(0.437)	(0.127)	(0.400)	(0.123)	(0.273)	(0.0876)	(0.292)	(0.0922)	(0.00534)	(0.00300)	(0.00555)	(0.00369)
ΔRWA	54.94**	16.30**			-10.28	-6.538			1.039	-2.146		
	(21.65)	(7.579)			(12.48)	(4.596)			(13.67)	(7.104)		
Δ(C)Tier1			-31.89	-7.499			-26.79	1.895			-80.75**	-11.54
			(47.29)	(17.00)			(53.17)	(17.84)			(35.20)	(22.92)
ΔNet Income					-65.19	-74.56	147.3	-16.93	11.20	23.27	11.40	22.76
					(138.9)	(47.31)	(232.2)	(75.42)	(40.13)	(19.55)	(32.42)	(18.65)
Constant	-0.877	-0.868	-4.522	-2.245*	1.764	1.120	1.785	1.057	-1.203	-0.384	-0.849	-0.290
	(2.683)	(1.164)	(2.727)	(1.159)	(4.578)	(1.504)	(4.687)	(1.586)	(1.583)	(0.947)	(1.209)	(0.841)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	71	71	71	71	36	36	36	36	44	44	44	44
R-squared	0.360	0.413	0.232	0.304	0.339	0.482	0.328	0.425	0.063	0.137	0.256	0.143

Last period

					EU 2011				EU 2014			
VARIABLES					ΔGap1	ΔGap2	ΔGap1	ΔGap2	ΔGap1	ΔGap2	ΔGap1	ΔGap2
					(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
PIIGS exposure					-1.532**	-0.549***	-1.503**	-0.539***	-0.00384	-0.00920***	0.00609	-0.0107***
					(0.608)	(0.155)	(0.553)	(0.133)	(0.00509)	(0.00281)	(0.00430)	(0.00368)
ΔRWA					3.907	1.507			3.330	-5.068		
					(4.492)	(1.790)			(9.411)	(5.214)		
Δ(C)Tier1							12.19	4.230			-43.75**	10.70
							(16.88)	(5.383)			(16.83)	(12.46)
ΔNet Income					497.9	159.2**	465.5	147.9**	4.822	26.67	3.409	27.44
					(368.2)	(77.33)	(349.9)	(66.64)	(31.78)	(17.93)	(28.43)	(17.54)
Constant					0.853	1.102	-0.478	0.610	-1.184	-0.373	-0.526	-0.549
					(3.505)	(1.280)	(3.424)	(1.211)	(1.495)	(0.879)	(1.403)	(0.972)
Controls					Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations					36	36	36	36	44	44	44	44
R-squared					0.446	0.515	0.443	0.511	0.066	0.180	0.190	0.169

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 12: Linear regression for US banks sample

For each bond issued on the 127-day period after the stress test disclosure, ΔGap1 is the difference between its notch rating absolute gap and the mean notch rating absolute gap computed for all bonds of the same issuing bank issued on the 127 day-period before the stress test disclosure date. ΔGap2 is the same indicator built for category rating. The rating absolute gap is the absolute difference between Moody's and Standard & Poor's bonds' ratings.. GAP_to_Assets is capital GAP from 2009 US stress test results for a specific bank divided by its total assets. . ΔTier1 is the difference between the Tier 1 capital ratio from the adverse scenario of the US stress test and the current tier 1 capital ratio. Net income is the net income rate over the period of the stress test adverse scenario of the US stress test. Total_loss_loan is the losses on total loans over the periods of the adverse scenario of US stress test divided by total loans. ΔLeverage is the difference between the leverage ratio from the adverse scenario of the US stress test and the current leverage ratio. Failed_dummy is a dummy variable equals to 1 when the bank failed the stress test and equals to 0 otherwise. Controls stands for the following variables: Average_rating, Ln_amount_issued (USD), Maturity (see table 2).

	US 2009		US 2012				US 2013				US 2014				US 2015			
VARIABLES	ΔGap1	ΔGap2	ΔGap1	ΔGap2	ΔGap1	ΔGap2	ΔGap1	ΔGap2	ΔGap1	ΔGap2	ΔGap1	ΔGap2	ΔGap1	ΔGap2	ΔGap1	ΔGap2	ΔGap1	ΔGap2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
Gap_to_Asset	-0.605**	-0.179*																
	(0.242)	(0.091)																
ΔTier1			1.247***	0.334*			0.001	0.008			-0.039***	-0.103**			0.516***	0.110*		
			(0.357)	(0.177)			(0.014)	(0.011)			(0.008)	(0.043)			(0.067)	(0.056)		
ΔLeverage							0.036	0.056	0.0271	0.069	0.110***	0.287*	0.074***	0.348**	-0.152	0.066	0.356*	0.230
							(0.043)	(0.040)	(0.049)	(0.047)	(0.008)	(0.155)	(0.019)	(0.147)	(0.183)	(0.154)	(0.212)	(0.144)
Net income					0.069***	0.0184**			0.029	-0.021			-0.013	-0.296***			0.463***	0.037
					(0.018)	(0.008)			(0.029)	(0.038)			(0.028)	(0.083)			(0.132)	(0.090)
Total_loss_loan	2.493	1.099	-0.351***	-0.132***	0.0297	-0.0299**	0.004	0.003	-0.001	0.014	-0.040***	0.022	-0.049***	0.042	-0.001	0.106**	0.168***	0.143***
	(1.518)	(0.760)	(0.0910)	(0.0482)	(0.0330)	(0.0130)	(0.0128)	(0.011)	(0.003)	(0.016)	(0.002)	(0.040)	(0.005)	(0.041)	(0.054)	(0.046)	(0.063)	(0.043)
Failed_dummy	-0.326	-0.499***																
	(0.305)	(0.093)																
Constant	2.798**	4.037***	6.932***	1.700*	0.742	0.0422	0.054	0.373	0.011	0.339	0.815***	0.912*	0.802***	0.537	0.457	0.797	0.901	0.859
	(1.172)	(0.151)	(1.928)	(1.020)	(0.691)	(0.431)	(0.266)	(0.235)	(0.187)	(0.208)	(0.037)	(0.522)	(0.045)	(0.584)	(0.643)	(0.538)	(0.817)	(0.554)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	55	55	105	105	105	105	150	150	150	150	101	101	101	101	72	72	72	72
R-squared	0.618	0.888	0.222	0.395	0.096	0.358	0.012	0.056	0.017	0.058	0.929	0.225	0.875	0.269	0.606	0.274	0.367	0.233

There are two panels of results for Europe depending on the specification of the stress test variables, either using values from the first period of the 2011 and 2014 stress test adverse scenarios or using values from the last period of these stress test adverse scenarios (Table 11[39])[40]. Given the context that prevailed during the first implementation of the European stress tests, we, first of all, focus on the PIIGS exposure. Banks' sovereign exposure were not reported in detailed in the banks' balance sheet, then market's participants could not get a clear vision about these exposures before they were disclosed by EBA tests. We find that banks' PIIGS debt exposure increases the rating disagreement[41] between Moody's and S&P for the first stress test conducted in 2010, with the higher significance of all the explanatory variables. The impact of the PIIGS exposure variable is positive both for notch and category GAP Uncertainty about PIIGS sovereign debts and the difficulty to evaluate their actual risk make the PIIGS global exposure cause and increase the split rating. Before the European sovereign crisis, sovereign debts were considered quite completely safe. With the outbreak of the Debt crisis, the question of sovereign credit risk arose in financial markets and gave rise to multiple views and prospects on the future of PIIGS solvability. Contrary to its impact in the first stress test, we find that the PIIGS countries debt exposure decreases the split rating both for notch and category gaps on the 2011 test and a similar but weaker effect only for category gap on the 2014 test. Furthermore PIIGS exposure has a stronger impact for 2011 in the regressions using the values of the last period of the adverse scenario, i.e. two-year horizon stressed variables, than using values of the first period of the adverse scenario, i.e. one-year horizon stressed variables[42]. The second and the third European test compared to the first one provided more detailed information on bank's resilience and the methodology was improved and scenarios more severe in order to increase the credibility of the stress test. These improvements, the strengthened transparency about sovereign exposure gradually reduced for many banks, more consensual mid-term views, could explain this negative impact on disagreements, and so a higher convergence of appraisal for

[39] There is only a one-year horizon in the 2010 European test.

[40] Given the strong correlation between the capitalization variables and the risk weighted assets variable, we do not include them simultaneously in our regressions.

[41] More precisely, a greater exposure tends to increase the disagreement after the test, which may, depending of the others variables influence, correspond, for a given bond to an increasing gap after the test (exposure foster this growth of split rating) or to a decreasing gap after the test (exposure penalize this reduction of split rating). This remark obviously applies to comments on each explanatory variable and on each test. The preliminary statistical analyze helps to determine for each test which situation, increasing or decreasing gap, is more likely to occur.

[42] PIIGS exposure depicts the same variable in table 11 but the stressed variables differ due to different choices of the time horizon of the scenario. In the EU 2011 tests, an increase in a bank PIIGS exposure along with the two-year horizon stressed variables appears to lead to a stronger impact than the same increase along with the one-year horizon stressed variables. That is why we may interpret this result as a mid-term impact of PIIGS exposure as it depends on mid-term views on others explanatory variables, leading to a stronger convergence of the ratings of the two agencies for high exposure.

those banks who remain with high PIIGS exposure after the second and, in a lesser extent, after the third stress test results disclosure. Indeed, the European sovereign crisis reached its peak and the financial market its highest uncertainty at the time of the 2011 test exercise. This situation created high need of information and transparency about banks' financial health that the 2011 test partly addressed while bringing relevant information to the market participants and reducing banks opacity (Petrella and Resti (2011)).

Risk weighted assets (RWA) are a wider indicator of banks credit risk. We can use the difference between the adverse scenario risk weighted assets (divided by the total assets) and the current ones as another (inverse) indicator of the expected resilience of the bank in the adverse scenario. Higher RWA has an impact on the split rating only after the disclosure of the 2010 results and leads to the same result as PIIGS exposure, both for notch and category splits, greater expected risks increase uncertainty and differences of opinion. One year later, in 2011, in a period marked by higher volatility, even if information on the bank difficulties that may occur on a one-year or two-year horizon should be more credible given the improvement of the test exercise and thus allowing markets and specifically agencies to converge towards common views, RWA variable shows no effect at all. In fact, the 2011 stress test brings more detailed information about banks' sovereign exposure which have certainly been the focal point of rating analysis, explaining the non-significance of a broader measure of weighted risks.

We now consider capital ratio variables which are of course major indicators to analyze the resistance of banks to extreme events. The difference between the stressed capital and the current one should indicate the resilience of the bank. And we could expect that a higher resilience (i.e. a higher difference meaning most often a lower decrease of Tier1) leads to a convergence of agency feelings about the solvability of the bank. It is indeed the result we find but only for the 2014 stress test (notch gaps). Noticeably, this result appears weaker when we use the final year of the adverse scenario as compared to the first year (table 11). An explanation may be found in a weaker confidence of markets participants at the height of the Debt Crisis in the true capacity of banks capital to withstand two years of adverse economic downturn.

Finally, the stressed net income compared to the current one has only one impact in 2014 for the category gaps at the two-year horizon meaning that agencies diverge on their assessment of a stronger resilience of the banking profit to extreme shocks.

The results for the US tests are shown in Table 12[43]. A higher capital shortfall from SCAP conducted in 2009 has a negative impact on the rating disagreement. This impact is mainly for notch split while the significance for the category split is low, the failed dummy becoming in this case the most powerful indicator of an improved agreement of agencies. On the other US stress tests the capital shortfall is not a data put forward in the results, thus, we consider the difference between the capital from the adverse scenario and the current capital. For the 2012 and 2015 US stress tests, the results show that there is an increase of disagreement rating for the more resilient banks (notch and category split) while during the 2014 stress test, the split rating decreases for these banks (only for notch split). Morgan et al. (2013) argue that before the disclosure of the 2009 stress test, financial market's participants are able to make difference between the good and bad banks but the thing they ignored is the extent of the capital shortfall. So, the disclosure of stress test results brought information which permits rating agencies to make less disagreement about banks' rating. For the 2012 US stress test, the positive impact of the capital on the split rating may be explained by the fact that four of the 19 BHCs participating to the stress test have one or more projected regulatory capital ratios that fall below regulatory capital minimum levels at some points over the stress scenario horizon. So, this may create doubt on the other banks having enough level of capital on their effective resilience to the adverse scenario. At the 2015 US stress test, some analysts suggest that few banks that heavily trade in the capital markets have post-stress minimum capital ratios close to the 8% requirement. The high positive impact on the notch and category split on the period after the disclosure of the 2015 stress test may be due to a lack of confidence in the way some banks have passed the test. Unlike other tests that indicate that worse news about the capital coverage tend to align the views of agencies, the 2014 US test shows a decrease in the notch split rating for the post-stress best capitalized banks. Nevertheless, the simple leverage ratio (calculated as the capital divided by total assets) has in this same test (and only for this one) an opposite effect and, as the other indicators in the others tests, increases disagreement in case of better news.

Total loan losses and Net Income ratio provide quite different results depending on the test. We find that agencies agree more in their interpretation of comparative bad results (disagree more for comparative good results) in 2012 for both variables. However, this stresses values have no impact at all in 2013 and provide exactly separate and opposite effects in 2014 and 2015 (agency

[43] We remind that there is only one stressed value available, at the end of the scenario, usually 9 quarters ahead.

views converge with increased loans losses and higher income in 2014, with reduced loan losses and weaker income in 2015).

Our global findings indicate the diversity of determinants of split rating changes both in the case of Europe and the US stress tests, without providing a clear vision of what could explain, in reference to our first statistical analysis, why certain tests lead and others not to a convergence of opinion of agencies. The mixed findings drawn over the different stress tests underline that several other factors could influence the interpretation of the rating agencies i.e. the credibility of the stress test, the backstops measures, the economic climate, etc. Because of the large panel of data disclosed by a stress test results disclosure, these information are highly submitted to a subjective perception and analysis of the news by the rating agencies as well as the different market's participants.

3.5. Conclusion

In this paper, we study the information value of banks' stress tests using banks' bond split ratings as an indicator of the efficiency of the disclosure of the stress test results. We consider ratings at issuance of bonds jointly rated by Moody's and Standard & Poor's and issued by banks participating to the European and US banks' stress tests conducted between 2009 and 2015. We first bring a statistical investigation analyzing the split ratings before and after each stress test results disclosure. Second, we run a linear model considering a split rating measure as the dependent variable and key results disclosed in the different stress tests conducted in Europe and in the United-States as explanatory variables.

Previous studies emphasized opposite effects of information disclosure suggesting that stress tests could as well decrease or increase uncertainty about banks' statements. Overall, our findings suggest that the impact of the stress test results disclosure is mixed both on the US and European banks' bond split ratings. Indeed, we underline many episodes where information disclosure increases the disagreements between rating agencies. Market participants could parse differently the detailed data disclosed by the stress tests and these differing interpretations may create more disagreements among different agents and, in our case, between rating agencies. However, in a period of turmoil as the European sovereign Debt Crisis, when the market faces a lot of fear and uncertainty and when information is highly needed, the disclosure of the stress tests results leads to a greater convergence of views of rating agencies.

Our econometrical investigation tries to determine which results might explain the observed changes in split ratings in pre/post disclosure periods and enlighten why some stress tests increase and others decrease split ratings. We focus on crucial disclosed information regarding to risk, capital and profitability of tested banks and find no clear-cut results that would allow us to clearly identify the causal factors of the change in absolute rating gaps around each stress test. The credibility of the testing procedure, the severity of the scenarios, crisis or non-crisis time, the regulatory backstops measures and the externalities related to disclosure could impact market participants' own perceptions of the stress tests and explain the mixed effects of disclosure. A deeper study would be needed to understand the exact reasons for these different and often opposite results, which would require a thorough individual analysis of each bank tested beyond the scope of this paper

This notwithstanding, supervisors may implement methods which may combine quantitative and qualitative assessments in order to provide unambiguous signals to the market, increasing the efficiency of the stress tests by a higher reliability in the results disclosed. An effective stress test may reach its objective of transparency by decreasing each bank's opacity but also by diminishing global sector uncertainty. This may be a big challenge to the extent that the tests are based on extreme events scenarios that are obviously not the most probable cases. Market actors like rating agencies interpret not only the thoroughness of the disclosed information but also the relevance of the assumptions made by supervisors, with possible own subjective and divergent interpretations but also high incentives to act in the same direction in distress periods.

Table 13: Correlation matrix of explanatory variables for Europe banks

Panel A : EU 2010

	PIIGS exposure	ΔTier1	ΔRWA	Average_rating	Ln_amount_issued	Maturity
PIIGS exposure	1.000					
ΔTier1	0.402	1.000				
ΔRWA	-0.173	-0.449	1.000			
Average_rating	0.243	-0.085	-0.120	1.000		
Ln_amount_issued	0.150	0.228	0.095	0.091	1.000	
Maturity	0.073	0.072	0.165	-0.060	-0.132	1.000

Panel B : EU 2011

First period

	PIIGS exposure	ΔCTier1	ΔRWA	ΔNet Income	Average_rating	Ln_amount_issued	Maturity
PIIGS exposure	1.000						
ΔCTier1	-0.126	1.000					
ΔRWA	0.036	-0.757	1.000				
ΔNet Income	0.163	0.258	0.041	1.000			
Average_rating	0.084	-0.306	0.258	-0.101	1.000		
Ln_amount_issued	0.152	0.173	-0.128	0.187	-0.033	1.000	
Maturity	0.023	-0.085	0.186	0.095	-0.192	0.194	1.000

Last period

	PIIGS exposure	ΔCTier1	ΔRWA	ΔNet Income	Average_rating	Ln_amount_issued	Maturity
PIIGS exposure	1.000						
ΔCTier1	0.219	1.000					
ΔRWA	-0.056	-0.638	1.000				
ΔNet Income	-0.170	-0.136	0.119	1.000			
Average_rating	0.084	0.332	-0.266	0.037	1.000		
Ln_amount_issued	0.152	-0.111	0.133	-0.064	-0.033	1.000	
Maturity	0.023	0.049	-0.174	-0.095	-0.192	0.194	1.000

Panel C : EU 2014

First period

	PIIGS exposure	ΔCTier1	ΔRWA	ΔNet Income	Average_rating	Ln_amount_issued	Maturity
PIIGS exposure	1.000						
ΔCTier1	0.399	1.000					
ΔRWA	-0.322	-0.536	1.000				
ΔNet Income	-0.330	-0.189	0.120	1.000			
Average_rating	0.194	0.186	-0.131	-0.157	1.000		
Ln_amount_issued	0.028	-0.019	0.008	0.080	0.183	1.000	
Maturity	0.088	0.125	-0.228	-0.054	0.011	0.095	1.000

Last period

	PIIGS exposure	ΔCTier1	ΔRWA	ΔNet Income	Average_rating	Ln_amount_issued	Maturity
PIIGS exposure	1.000						
ΔCTier1	0.421	1.000					
ΔRWA	-0.123	-0.129	1.000				
ΔNet Income	-0.326	-0.343	-0.131	1.000			
Average_rating	0.194	0.339	0.077	-0.184	1.000		
Ln_amount_issued	0.028	-0.025	-0.133	0.050	0.183	1.000	
Maturity	0.088	0.080	-0.174	-0.053	0.011	0.095	1.000

Table 14: Correlation matrix of explanatory variables for US banks

Panel A: US 2009

	Gap_to_Asset	Total_loss_loan	Failed_dummy	Average_rating	Ln_amount_issued	Maturity
Gap_to_Asset	1.000					
Total_loss_loan	0.437	1.000				
Failed_dummy	-0.310	-0.371	1.000			
Average_rating	0.017	-0.043	-0.237	1.000		
Ln_amount_issued	0.078	0.276	-0.053	-0.291	1.000	
Maturity	-0.104	-0.147	0.187	0.232	-0.050	1.000

Panel B: US 2012

	ΔTier1	Net income	Total_loss_loan	Average_rating	Ln_amount_issued	Maturity
ΔTier1	1.000					
Net income	-0.224	1.000				
Total_loss_loan	0.156	-0.308	1.000			
Average_rating	-0.061	0.183	-0.022	1.000		
Ln_amount_issued	0.153	-0.143	0.243	-0.121	1.000	
Maturity	-0.038	0.089	-0.167	0.196	-0.213	1.000

Panel C: US 2013

	ΔTier1	ΔLeverage	Net income	Total_loss_loan	Average_rating	Ln_amount_issued	Maturity
ΔTier1	1.000						
ΔLeverage	0.035	1.000					
Net income	0.564	0.276	1.000				
Total_loss_loan	0.301	-0.298	0.372	1.000			
Average_rating	-0.227	-0.038	-0.541	-0.038	1.000		
Ln_amount_issued	0.211	-0.085	0.064	0.201	-0.284	1.000	
Maturity	-0.006	0.120	0.011	-0.057	0.302	-0.173	1.000

Panel D: US 2014

	ΔTier1	ΔLeverage	Net income	Total_loss_loan	Average_rating	Ln_amount_issued	Maturity
ΔTier1	1.000						
ΔLeverage	0.305	1.000					
Net income	0.853	0.370	1.000				
Total_loss_loan	0.162	0.065	0.278	1.000			
Average_rating	0.102	-0.333	-0.011	0.035	1.000		
Ln_amount_issued	0.288	0.023	0.287	0.299	-0.311	1.000	
Maturity	-0.044	0.063	-0.059	-0.144	0.190	-0.142	1.000

Panel E: US 2015

	ΔTier1	ΔLeverage	Net income	Total_loss_loan	Average_rating	Ln_amount_issued	Maturity
ΔTier1	1.000						
ΔLeverage	0.346	1.000					
Net income	0.804	0.303	1.000				
Total_loss_loan	0.422	-0.020	0.403	1.000			
Average_rating	0.096	0.062	0.094	0.096	1.000		
Ln_amount_issued	0.342	0.191	0.269	0.312	-0.072	1.000	
Maturity	-0.054	0.049	-0.040	-0.170	0.314	-0.133	1.000

Appendix:

Table A1: Rating class and rating numerical scales

Common category rating numerical scale	Common notch rating numerical scale	Agency rating scales	
		Moody's	Standard & Poor's
1	1	Aaa	AAA
2	2	Aa1	AA+
	3	Aa2	AA
	4	Aa3	AA-
3	5	A1	A+
	6	A2	A
	7	A3	A-
4	8	Baa1	BBB+
	9	Baa2	BBB
	10	Baa3	BBB-
5	11	Ba1	BB+
	12	Ba2	BB
	13	Ba3	BB-
6	14	B1	B+
	15	B2	B
	16	B3	B-
7	17	Caa1	CCC+
	18	Caa2	CCC
	19	Caa3	CCC-

Table A2: **Moody's and S&P** European and United-States banks' bonds rating and bonds characteristics, by issue period (**same issuing banks before and after each stress test**).

This table reports mean rating and characteristics of bonds issued by European tested banks and United-States tested banks for each stress test, with a sample restricted for a given test to the banks having issued bonds both in the 127-day-period before and in the 127-day period after this test. Statistics are computed and reported on the each stress test results disclosure date. Issues/Issuers indicates respectively the number of bonds issued and the number of issuers on the period considered. Average rating is the average of Moody's and Standard & Poor's ratings, computed on a notch basis or on a category basis (higher value of Average rating indicates higher risk). Maturity is expressed in years. Amount issued is the total amount of the bond's issue.

Issue period	Issues/Issuers (number)	Average notch rating	Average category rating	Maturity (mean, years)	Amount issued (mean, EUR millions)
Europe					(mean, EUR millions)
Tested Banks - all sample period	**886/24**	**5.57**	**2.83**	**5.83**	**560.50**
127 days before the 2010 stress test	64/16	4.05	2.32	6.40	608.48
127 days after the 2010 stress test	81/16	4.06	2.37	5.19	626.89
127 days before the 2011 stress test	88/16	4.80	2.48	5.71	562.62
127 days after the 2011 stress test	36/16	5.31	2.79	5.93	364.29
127 days before the 2014 stress test	52/14	6.96	3.27	5.78	540.22
127 days after the 2014 stress test	46/14	6.87	3.53	5.75	677.13
United-States					(mean, USD millions)
Tested Banks - all sample period	**1918/13**	**6.27**	**3.07**	**9.42**	**429.06**
127 days before the 2009 stress test	37/8	1.92	1.42	3.97	1963.11
127 days after the 2009 stress test	59/8	5.40	2.88	6.36	709.99
127 days before the 2011 stress test	248/6	5.74	2.94	9.73	284.94
127 days after the 2011 stress test	199/6	5.76	2.94	11.36	262.83
127 days before the 2012 stress test	121/6	5.99	3.00	8.20	279.49
127 days after the 2012 stress test	105/6	6.47	3.11	8.42	259.57
127 days before the 2013 stress test	170/8	7.24	3.33	9.15	460.89
127 days after the 2013 stress test	150/8	7.17	3.30	9.92	253.95
127 days before the 2014 stress test	108/6	7.16	3.30	11.33	557.29
127 days after the 2014 stress test	125/6	7.40	3.41	10.67	518.32
127 days before the 2015 stress test	91/8	7.39	3.40	11.31	534.77
127 days after the 2015 stress test	72/8	7.08	3.31	9.03	990.51

Table A3: Measures of disagreement between **Moody's and S&P** for European and United-States banks' bonds ratings (**same issuing banks before and after each stress test**).

This table reports different bonds disagreement measures between Moody's and Standard & Poor's. Correlation is the correlation index between their ratings. Moody's <> S&P indicates the percentage of their disagreements .Absolute gap is the absolute difference between Moody's and Standard & Poor's ratings. Rating gap distribution represents the percentage of Gap= 1, Gap= 2 or Gap = 3 and more in the total number of disagreements.

	Average ratings				Rating gap distribution (%)		
Issue period	(Moody's/S&P)	Correlation between ratings	Moody's <> S&P (%)	Average absolute gap	Gap=1	Gap=2	Gap=3+
Europe							
			Notch rating				
Tested Banks - all sample period	**5.43/5.7**	**0.83**	**55.4**	**0.88**	**64.2**	**24.6**	**11.2**
127 days before the 2010 stress test	3.42/4.69	0.71	76.6	1.42	42.9	44.9	12.2
127 days after the 2010 stress test	3.37/4.75	0.54	76.5	1.63	33.9	46.8	19.4
127 days before the 2011 stress test	4.31/5.28	0.75	53.4	1.02	48.9	27.7	23.4
127 days after the 2011 stress test	5/5.61	0.55	38.9	1.00	57.1	0.0	42.9
127 days before the 2014 stress test	7.15/6.77	0.94	38.5	0.50	70.0	30.0	0.0
127 days after the 2014 stress test	6.85/6.89	0.85	54.3	0.78	72.0	16.0	12.0
			Category rating				
Tested Banks - all sample period	**2.77/2.89**	**0.77**	**25.08**	**0.29**	**89.5**	**10.5**	**0.0**
127 days before the 2010 stress test	2.04/2.47	0.63	41.1	0.45	90.0	10.0	0.0
127 days after the 2010 stress test	2.07/2.55	0.45	51.2	0.60	83.7	16.3	0.0
127 days before the 2011 stress test	2.34/2.6	0.64	33.0	0.38	84.2	15.8	0.0
127 days after the 2011 stress test	2.58/2.83	0.52	19.4	0.31	42.9	57.1	0.0
127 days before the 2014 stress test	3.28/3.11	0.88	19.7	0.20	100.0	0.0	0.0
127 days after the 2014 stress test	3.36/3.34	0.71	28.3	0.28	100.0	0.0	0.0
United-States							
			Notch rating				
Tested Banks - all sample period	**6.27/6.27**	**0.79**	**70.1**	**0.89**	**73.6**	**26.0**	**0.4**
127 days before the 2009 stress test	1.84/2	0.99	16.2	0.16	100.0	0.0	0.0
127 days after the 2009 stress test	5.12/5.68	0.84	62.7	0.63	100.0	0.0	0.0
127 days before the 2011 stress test	5.41/6.07	0.73	66.5	0.77	83.6	16.4	0.0
127 days after the 2011 stress test	5.52/6.01	0.74	79.9	0.98	77.4	22.6	0.0
127 days before the 2012 stress test	5.68/6.31	0.35	93.4	1.42	47.8	52.2	0.0
127 days after the 2012 stress test	6.19/6.75	0.57	83.8	1.29	46.6	53.4	0.0
127 days before the 2013 stress test	7.5/6.98	0.86	57.6	0.64	89.8	10.2	0.0
127 days after the 2013 stress test	7.41/6.93	0.87	52.7	0.56	93.7	6.3	0.0
127 days before the 2014 stress test	7.71/6.61	0.77	88.9	1.12	74.0	26.0	0.0
127 days after the 2014 stress test	8.13/6.66	0.88	100.0	1.50	50.4	49.6	0.0
127 days before the 2015 stress test	8.12/6.66	0.92	98.9	1.46	52.2	47.8	0.0
127 days after the 2015 stress test	7.56/6.6	0.85	72.2	0.96	67.3	32.7	0.0
			Category rating				
Tested Banks - all sample period	**3.16/2.99**	**0.63**	**31.9**	**0.32**	**100.0**	**0.0**	**0.0**
127 days before the 2009 stress test	1.41/1.43	0.98	2.7	0.03	100.0	0.0	0.0
127 days after the 2009 stress test	2.86/2.9	0.71	10.2	0.10	100.0	0.0	0.0
127 days before the 2011 stress test	2.88/2.99	0.49	17.3	0.17	100.0	0.0	0.0
127 days after the 2011 stress test	2.95/2.94	0.58	26.1	0.26	100.0	0.0	0.0
127 days before the 2012 stress test	3.03/2.97	0.37	29.8	0.30	100.0	0.0	0.0
127 days after the 2012 stress test	3.17/3.06	0.70	17.1	0.17	100.0	0.0	0.0
127 days before the 2013 stress test	3.52/3.14	0.50	47.6	0.48	100.0	0.0	0.0
127 days after the 2013 stress test	3.49/3.11	0.57	41.3	0.41	100.0	0.0	0.0
127 days before the 2014 stress test	3.57/3.02	0.12	55.6	0.56	100.0	0.0	0.0
127 days after the 2014 stress test	3.76/3.06	0.15	69.6	0.70	100.0	0.0	0.0
127 days before the 2015 stress test	3.78/3.02	0.08	75.8	0.76	100.0	0.0	0.0
127 days after the 2015 stress test	3.51/3.1	0.32	41.7	0.42	100.0	0.0	0.0

Table A4: **Moody's and Fitch** European and United-States banks' bonds rating and bonds characteristics, by issue period.

This table reports mean rating and characteristics of bonds issued by European banks and United-States tested banks around each stress test. Statistics are computed and reported on the 127-day-period before and 127-day period after each stress test results disclosure date. Issues/Issuers indicates respectively the number of bonds issued and the number of issuers on the period considered. Average rating is the average of Moody's and Fitch ratings, computed on a notch basis or on a category basis (higher value of Average rating indicates higher risk). Maturity is expressed in years. Amount issued is the total amount of the bond's issue.

Issue period	Issues/Issuers (number)	Average notch rating	Average category rating	Maturity (mean, years)	Amount issued
Europe					(mean, EUR millions)
Tested Banks - all sample period	**721/36**	**5.61**	**2.88**	**6.02**	**648.72**
127 days before the 2010 stress test	53/19	4.08	2.27	7.63	779.17
127 days after the 2010 stress test	54/14	4.16	2.37	5.47	834.02
127 days before the 2011 stress test	86/21	4.40	2.44	6.07	737.48
127 days after the 2011 stress test	25/14	5.10	2.70	5.73	329.66
127 days before the 2014 stress test	55/15	6.58	3.23	5.80	609.25
127 days after the 2014 stress test	48/14	6.65	3.29	6.20	746.79
United-States					(mean, USD millions)
Tested Banks - all sample period	**1421/16**	**5.62**	**2.95**	**8.83**	**582.13**
127 days before the 2009 stress test	39/10	1.77	1.36	3.93	1895.00
127 days after the 2009 stress test	51/10	4.99	2.82	6.32	912.02
127 days before the 2011 stress test	247/8	5.26	2.87	9.73	313.08
127 days after the 2011 stress test	171/7	5.52	2.93	11.84	309.14
127 days before the 2012 stress test	85/6	5.78	2.96	8.62	376.69
127 days after the 2012 stress test	64/6	5.88	3.01	8.20	412.52
127 days before the 2013 stress test	85/7	6.74	3.31	7.66	925.16
127 days after the 2013 stress test	68/9	6.87	3.37	7.67	598.61
127 days before the 2014 stress test	46/7	6.83	3.29	10.22	1377.77
127 days after the 2014 stress test	59/9	6.72	3.19	7.66	1103.01
127 days before the 2015 stress test	45/9	7.12	3.39	7.32	1122.71
127 days after the 2015 stress test	64/8	6.47	3.09	8.74	1117.70

Table A5: Measures of disagreement between **Moody's and Fitch** for European and United-States banks' bonds ratings.

This table reports different bonds disagreement measures between Moody's and Fitch. Correlation is the correlation index between their ratings. Moody's <> Fitch indicates the percentage of their disagreements .Absolute gap is the absolute difference between Moody's and Fitch ratings. Rating gap distribution represents the percentage of Gap= 1, Gap= 2 or Gap = 3 and more in the total number of disagreements.

	Average ratings				Rating gap distribution (%)		
Issue period	(Moody's/Fitch)	Correlation between ratings	Moody's <> Fitch (%)	Average absolute gap	Gap=1	Gap=2	Gap=3+
Europe							
Notch rating							
Tested Banks - all sample period	**5.73/5.48**	**0.86**	**64.4**	**0.97**	**67.9**	**19.8**	**12.3**
127 days before the 2010 stress test	3.74/4.42	0.83	73.6	1.02	69.2	25.6	5.1
127 days after the 2010 stress test	3.56/4.76	0.83	85.2	1.31	58.7	37.0	4.3
127 days before the 2011 stress test	4.05/4.74	0.78	66.3	1.00	66.7	24.6	8.8
127 days after the 2011 stress test	5.16/5.04	0.82	68.0	0.84	76.5	23.5	0.0
127 days before the 2014 stress test	7.05/6.11	0.93	50.9	0.98	35.7	42.9	21.4
127 days after the 2014 stress test	7.15/6.15	0.88	56.3	1.13	48.1	14.8	37.0
Category rating							
Tested Banks - all sample period	**2.89/2.87**	**0.81**	**25.0**	**0.26**	**95.0**	**5.0**	**0.0**
127 days before the 2010 stress test	2.15/2.4	0.71	37.7	0.40	95.0	5.0	0.0
127 days after the 2010 stress test	2.17/2.57	0.72	40.7	0.44	90.9	9.1	0.0
127 days before the 2011 stress test	2.34/2.55	0.76	23.3	0.26	90.0	10.0	0.0
127 days after the 2011 stress test	2.68/2.72	0.70	28.0	0.28	100.0	0.0	0.0
127 days before the 2014 stress test	3.36/3.09	0.90	25.5	0.27	92.9	7.1	0.0
127 days after the 2014 stress test	3.4/3.19	0.55	29.2	0.33	85.7	14.3	0.0
United-States							
Notch rating							
Tested Banks - all sample period	**5.99/5.25**	**0.82**	**58.5**	**0.93**	**51.0**	**38.6**	**10.3**
127 days before the 2009 stress test	1.79/1.74	0.99	5.1	0.05	100.0	0.0	0.0
127 days after the 2009 stress test	5.18/4.8	0.84	31.4	0.37	81.3	18.8	0.0
127 days before the 2011 stress test	5.43/5.08	0.86	32.0	0.35	89.9	10.1	0.0
127 days after the 2011 stress test	5.62/5.43	0.78	45.6	0.60	67.9	32.1	0.0
127 days before the 2012 stress test	5.91/5.66	0.55	65.9	0.95	55.4	44.6	0.0
127 days after the 2012 stress test	6/5.77	0.68	79.7	1.14	62.7	31.4	5.9
127 days before the 2013 stress test	7.64/5.84	0.92	100.0	1.80	31.8	56.5	11.8
127 days after the 2013 stress test	7.69/6.04	0.91	91.2	1.65	25.8	67.7	6.5
127 days before the 2014 stress test	7.89/5.76	0.96	97.8	2.13	2.2	77.8	20.0
127 days after the 2014 stress test	7.9/5.54	0.88	96.6	2.36	3.5	49.1	47.4
127 days before the 2015 stress test	8.33/5.91	0.98	100.0	2.42	2.2	53.3	44.4
127 days after the 2015 stress test	7.48/5.45	0.87	100.0	2.03	18.8	60.9	20.3
Category rating							
Tested Banks - all sample period	**3.07/2.82**	**0.76**	**26.9**	**0.27**	**100.0**	**0.0**	**0.0**
127 days before the 2009 stress test	1.38/1.33	0.96	5.1	0.05	100.0	0.0	0.0
127 days after the 2009 stress test	2.84/2.8	0.92	3.9	0.04	100.0	0.0	0.0
127 days before the 2011 stress test	2.89/2.85	0.90	4.0	0.04	100.0	0.0	0.0
127 days after the 2011 stress test	3.02/2.84	0.74	17.5	0.18	100.0	0.0	0.0
127 days before the 2012 stress test	3.12/2.81	0.59	30.6	0.31	100.0	0.0	0.0
127 days after the 2012 stress test	3.17/2.84	0.69	32.8	0.33	100.0	0.0	0.0
127 days before the 2013 stress test	3.61/3	0.69	61.2	0.61	100.0	0.0	0.0
127 days after the 2013 stress test	3.71/3.03	0.74	67.6	0.68	100.0	0.0	0.0
127 days before the 2014 stress test	3.54/3.04	0.78	50.0	0.50	100.0	0.0	0.0
127 days after the 2014 stress test	3.63/2.75	0.82	88.1	0.88	100.0	0.0	0.0
127 days before the 2015 stress test	3.8/2.98	0.89	82.2	0.82	100.0	0.0	0.0
127 days after the 2015 stress test	3.47/2.7	0.63	76.6	0.77	100.0	0.0	0.0

Table A6: **Fitch and S&P** European and United-States banks' bonds rating and bonds characteristics, by issue period.

This table reports mean rating and characteristics of bonds issued by European banks and United-States tested banks around each stress test. Statistics are computed and reported on the 127-day-period before and 127-day period after each stress test results disclosure date. Issues/Issuers indicates respectively the number of bonds issued and the number of issuers on the period considered. Average rating is the average of Fitch and Standard & Poor's ratings, computed on a notch basis or on a category basis (higher value of Average rating indicates higher risk). Maturity is expressed in years. Amount issued is the total amount of the bond's issue.

Issue period	Issues/Issuers (number)	Average notch rating	Average category rating	Maturity (mean, years)	Amount issued
Europe					(mean, EUR millions)
Tested Banks - all sample period	**721/36**	**5.67**	**2.92**	**6.02**	**648.72**
127 days before the 2010 stress test	53/19	4.63	2.47	7.63	779.17
127 days after the 2010 stress test	54/14	4.72	2.56	5.47	834.02
127 days before the 2011 stress test	86/21	4.81	2.57	6.07	737.48
127 days after the 2011 stress test	25/14	5.14	2.72	5.73	329.66
127 days before the 2014 stress test	55/15	6.37	3.14	5.80	609.25
127 days after the 2014 stress test	48/14	6.63	3.30	6.20	746.79
United-States					(mean, USD millions)
Tested Banks - all sample period	**1421/16**	**5.69**	**2.91**	**8.83**	**582.13**
127 days before the 2009 stress test	39/10	1.85	1.37	3.93	1895.00
127 days after the 2009 stress test	51/10	5.27	2.87	6.32	912.02
127 days before the 2011 stress test	247/8	5.58	2.93	9.73	313.08
127 days after the 2011 stress test	171/7	5.73	2.89	11.84	309.14
127 days before the 2012 stress test	85/6	6.04	2.90	8.62	376.69
127 days after the 2012 stress test	64/6	6.28	2.97	8.20	412.52
127 days before the 2013 stress test	85/7	6.42	3.11	7.66	925.16
127 days after the 2013 stress test	68/9	6.53	3.12	7.67	598.61
127 days before the 2014 stress test	46/7	6.24	3.11	10.22	1377.77
127 days after the 2014 stress test	59/9	6.03	2.96	7.66	1103.01
127 days before the 2015 stress test	45/9	6.39	3.10	7.32	1122.71
127 days after the 2015 stress test	64/8	6.02	2.91	8.74	1117.70

Table A7: Measures of disagreement between **Fitch and S&P** for European and United-States banks' bonds ratings.

This table reports different bonds disagreement measures between Fitch and Standard & Poor's. Correlation is the correlation index between their ratings. Fitch <> S&P indicates the percentage of their disagreements .Absolute gap is the absolute difference between and Standard & Poor's ratings. Rating gap distribution represents the percentage of Gap= 1, Gap= 2 or Gap = 3 and more in the total number of disagreements.

	Average ratings				Rating gap distribution (%)		
Issue period	(Fitch/S&P)	Correlation between ratings	Fitch <> S&P (%)	Average absolute gap	Gap=1	Gap=2	Gap=3+
Europe							
Notch rating							
Tested Banks - all sample period	**5.48/5.86**	**0.85**	**45.1**	**0.74**	**60.3**	**22.8**	**16.9**
127 days before the 2010 stress test	4.42/4.85	0.79	37.7	0.66	65.0	20.0	15.0
127 days after the 2010 stress test	4.76/4.69	0.80	35.2	0.59	63.2	21.1	15.8
127 days before the 2011 stress test	4.74/4.88	0.71	48.8	0.81	64.3	19.0	16.7
127 days after the 2011 stress test	5.04/5.24	0.61	72.0	1.00	72.2	22.2	5.6
127 days before the 2014 stress test	6.11/6.64	0.94	41.8	0.60	73.9	13.0	13.0
127 days after the 2014 stress test	6.15/7.1	0.89	47.9	1.04	13.0	56.5	30.4
Category rating							
Tested Banks - all sample period	**2.87/2.97**	**0.81**	**21.5**	**0.23**	**92.9**	**7.1**	**0.0**
127 days before the 2010 stress test	2.4/2.55	0.83	9.4	0.15	40.0	60.0	0.0
127 days after the 2010 stress test	2.57/2.56	0.73	18.5	0.24	70.0	30.0	0.0
127 days before the 2011 stress test	2.55/2.59	0.65	23.3	0.28	80.0	20.0	0.0
127 days after the 2011 stress test	2.72/2.72	0.63	32.0	0.32	100.0	0.0	0.0
127 days before the 2014 stress test	3.09/3.18	0.93	12.7	0.13	100.0	0.0	0.0
127 days after the 2014 stress test	3.19/3.42	0.64	27.1	0.27	100.0	0.0	0.0
United-States							
Notch rating							
Tested Banks - all sample period	**5.25/6.14**	**0.93**	**83.3**	**0.92**	**91.7**	**6.4**	**1.9**
127 days before the 2009 stress test	1.74/1.95	1.00	20.5	0.21	100.0	0.0	0.0
127 days after the 2009 stress test	4.8/5.75	0.86	82.4	0.94	92.9	0.0	7.1
127 days before the 2011 stress test	5.08/6.09	0.88	89.5	1.00	88.7	10.4	0.9
127 days after the 2011 stress test	5.43/6.02	0.91	51.5	0.60	87.5	9.1	3.4
127 days before the 2012 stress test	5.66/6.42	0.89	70.6	0.76	91.7	8.3	0.0
127 days after the 2012 stress test	5.77/6.8	0.99	100.0	1.03	96.9	3.1	0.0
127 days before the 2013 stress test	5.84/7.01	0.92	98.8	1.18	90.5	0.0	9.5
127 days after the 2013 stress test	6.04/7.01	0.97	91.2	0.97	96.8	0.0	3.2
127 days before the 2014 stress test	5.76/6.72	0.98	91.3	0.96	95.2	4.8	0.0
127 days after the 2014 stress test	5.54/6.51	0.99	96.6	0.97	100.0	0.0	0.0
127 days before the 2015 stress test	5.91/6.87	0.99	95.6	0.96	100.0	0.0	0.0
127 days after the 2015 stress test	5.45/6.58	0.94	98.4	1.13	85.7	14.3	0.0
Category rating							
Tested Banks - all sample period	**2.82/2.99**	**0.76**	**18.0**	**0.18**	**100.0**	**0.0**	**0.0**
127 days before the 2009 stress test	1.33/1.41	0.95	7.7	0.08	100.0	0.0	0.0
127 days after the 2009 stress test	2.8/2.94	0.76	13.7	0.14	100.0	0.0	0.0
127 days before the 2011 stress test	2.85/3.01	0.56	16.2	0.16	100.0	0.0	0.0
127 days after the 2011 stress test	2.84/2.94	0.87	9.4	0.09	100.0	0.0	0.0
127 days before the 2012 stress test	2.81/2.99	0.62	17.6	0.18	100.0	0.0	0.0
127 days after the 2012 stress test	2.84/3.09	0.69	25.0	0.25	100.0	0.0	0.0
127 days before the 2013 stress test	3/3.21	0.75	21.2	0.21	100.0	0.0	0.0
127 days after the 2013 stress test	3.03/3.21	0.81	17.6	0.18	100.0	0.0	0.0
127 days before the 2014 stress test	3.04/3.17	0.85	13.0	0.13	100.0	0.0	0.0
127 days after the 2014 stress test	2.75/3.17	0.52	42.4	0.42	100.0	0.0	0.0
127 days before the 2015 stress test	2.98/3.22	0.85	24.4	0.24	100.0	0.0	0.0
127 days after the 2015 stress test	2.7/3.11	0.31	40.6	0.41	100.0	0.0	0.0

GENERAL CONCLUSION

These last years, the banking stress tests have taken an important place in the banking regulation because they are supposed to reassure financial markets about banks' financial health but also to provide more information on banks to investors. Since the end of the financial crisis in 2009, stress tests have been regularly conducted in Europe and in the United-States. In this dissertation, we consider the different stress tests conducted in these two regions and analyze their impact on the financial market's participants in three different chapters.

In the first chapter, we investigate how stockholders and bondholders react to the European stress test conducted in 2011 during the European sovereign debt crisis. The second chapter considers stress tests conducted in Europe and in the United-States and analyzes their impact on banks' stock prices. The third chapter of this dissertation studies if the disclosure of the stress tests results brings valuable information to credit rating agencies, which are supposed to have privileged information because of their rating activity.

We can highlight several lessons from these investigations. It is known that the stress tests are generally conducted in order to respond to investors' concerns about banks' financial health but also to increase transparency. Because of the high volatility of market prices in time of financial crisis, some market participants may not pay attention to the disclosed information and their behavior may be conducted by the panic caused by the crisis. As we found in the first chapter of this dissertation, the bondholders' reactions during a crisis period are more conducted by the financial distress than by the stress test specific data disclosed. However, stockholders value the stress test information as their reaction is more specific and less influenced by the crisis. So, the realization of a stress test during a financial crisis period may not be reassuring for all the investors in the financial markets. Furthermore, the fact that in a crisis period the agents' reaction tends to be synchronized may decrease the benefits of the stress tests. Indeed, even if there is information brought by the stress tests, the agents may have greater incentives to follow the market movement's directions. An effective stress test should decrease the uncertainty and reassure market's participants about banks' situation. Thus, during a crisis period, the effectiveness of the stress test may decrease although there is a high information need. Besides the financial crisis, the effectiveness of the stress test may also be affected by the credibility of the backstops measures provided to investors. For example, when we consider the stress test conducted in Europe and in the US, the investors value more positively the stress tests conducted in the US than the stress test conducted in Europe. The single regulator (Federal Reserve) and the common fiscal policy in the US could be more reassuring for investors notably concerning the bailout of the banks having capital shortfall identified by the stress test. In the

case of Europe, even if there is a single regulator (the European Central Bank), the fiscal policy is not unified making the establishment of banks' capital assistance plans more difficult. Our investigation also shows that the stress tests bring transparency not only for banks that participated to them but also for banks that do not participated both in the case of Europe and the US. The fact that the stress tests disclosed all detailed credit exposures in the banks' balance sheets and because of the interbank activities, news revealed on banks participating to the stress tests may affect other banks even if they do not participate to the exercise. By analyzing the reactions of the stock market to the stress test news according to the banks' opacity level, we find that the market reaction is greater for less opaque banks than for highly opaque banks. This means that the stress test brings transparency mainly for banks whose opacity is not very high. On the other hand, frequent and granular disclosure may have some negative impacts on the financial market. The detailed data disclosed by the stress tests could lead to different interpretations due to subjective perceptions from the investors. We find that these different interpretations conduct to the increase in the rating disagreements between the credit rating agencies. Indeed, around most of the stress test conducted in the Europe and in the US, the split ratings tend to increase meaning that the granular disclosure of the stress test results creates more disagreements between the credit ratings agencies. Nevertheless, we also find a decrease in split ratings after the disclosure of some stress tests showing a mixed effect of the stress tests.

Thus, even if the stress tests bring detailed information about banks, their effectiveness could be limited by several factors such as their credibility, the period of disclosure (crisis or non-crisis period), the backstops measures proposed by the regulators, the individual stress test analysis of each agents and other externalities related to the disclosure. This could lead to different perceptions of the stress tests between market's participants and could contribute to decrease the impact of the stress test on the financial market.

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Contents

CHAPTER 3……87

What is the information value of bank's stress tests? *An investigation using banks' bond split ratings*

RESUMÉ DE LA THÈSE EN FRANÇAIS

Cette thèse étudie l'impact des stress tests bancaires sur les différents acteurs du marché. Le premier chapitre analyse comment les actionnaires et les détenteurs d'obligations bancaires réagissent à l'information transmise par les stress tests durant une période de crise. Il s'appuie sur le test de résistance conduit en 2011 par l'Autorité Bancaire Européenne (ABE) au moment de la crise de la dette souveraine. Une étude économétrique de nature événementielle révèle que les actionnaires réagissent davantage aux informations spécifiques à chaque banque alors que les détenteurs d'obligations ont en général des réactions de nature plus macroéconomique et sont plus influencés par l'impact global de la crise financière. Cependant, si on va plus loin dans l'analyse, en prenant en compte différentes catégories d'obligations, on montre que le comportement des détenteurs de dette subordonnée tend à rejoindre celui des actionnaires. Cette réaction spécifique des actionnaires et des créanciers qui en sont les plus proches démontre que ce sont les acteurs les plus à même d'exercer une discipline de marché en période de crise financière.

Le second chapitre prend en compte les stress tests bancaires menés en Europe et aux Etats-Unis et analyse leur contenu informationnel à partir de leur impact sur le cours des actions bancaires. L'objectif est de déterminer si cet impact est fonction du degré d'opacité des banques. On montre tout d'abord que le marché réagit significativement à l'annonce des résultats des stress tests à la fois pour les banques testées et les banques non testées. On met ensuite en évidence une relation non linéaire entre le degré d'opacité des banques et l'impact des stress tests, indiquant que les tests ont un contenu informatif pour les banques moyennement opaques mais pas pour celles qui sont déjà très transparentes ou au contraire très opaques.

Le troisième chapitre étudie l'impact de la publication des résultats des stress tests sur les divergences de notations à l'émission des obligations bancaires. On met l'accent sur les notations de Moody's et de Standard & Poor's concernant les obligations émises par les banques ayant participé aux différents stress tests européens et américains. L'analyse de l'évolution des divergences de rating sur les périodes avant et après chaque stress test montre que la publication des résultats peut globalement accroître ou réduire ces divergences selon le test considéré. Les agences de notation peuvent donc interpréter les résultats détaillés des stress tests différemment et leur impact n'est donc pas univoque, pouvant même provoquer plus de divergences. Cependant, dans des périodes fortement troublées, telles que celle de la crise de la dette souveraine européenne, où le marché est confronté à beaucoup d'incertitudes et à un fort besoin d'information, les résultats des stress tests conduisent à une plus grande convergence des agences sur leurs notations des obligations bancaires.

Mots-clés : Banques, Stress tests, opacité, révélation de l'information, actionnaires, obligataires, crise financière, économétrie événementielle.

RESUMÉ DE LA THÈSE EN ANGLAIS

This dissertation studies the impact of banks' stress tests on the different market players. The first chapter analyzes how stockholders and bondholders react to the information disclosed in the financial market during crisis periods. We consider the 2011 EBA stress test as it discloses detailed information about banks and it is conducted during the European sovereign debt crisis. We use an event study methodology and find that stockholders' reaction is more specific to the information disclosed, while bondholders have generally macro reaction and are more sensible to the financial crisis. However, when we go further in our analysis by considering the different categories of bonds, we find that the behavior of subordinated bondholders tends to be closer to the behavior of stockholders. This specific reaction of stockholders during financial distress may make them more susceptible to impose market discipline when there is a financial crisis.

In a second chapter, we consider European and US banks' stress tests to analyze the information value of the stress tests using stock market prices. We investigate if the stock market reactions to the stress test results are different according to the degree of opacity of banks. We find that the stock market reacts significantly to the disclosure of the stress tests' results on the whole banks (tested and non-tested) meaning that the stress test transparency has an impact not only on tested banks but also on banks that do not participated to the stress test. By separating the sample of banks in less opaque and highly opaque banks, we find a non-linear relation between opacity and market reaction.

The third chapter of this thesis investigates the impact of the disclosure of the stress tests results on the credit rating agencies' split ratings on bonds issued by banks. To calculate the split rating variable, we consider bonds jointly rated by Moody's and Standard & Poor's and issued by banks that participated to the European and US banks' stress tests. The analysis of the split ratings on the period before and after each stress test results disclosure in Europe and in the US shows that the stress tests have mixed effect on credit rating agencies. Market participants could interpret the detailed data disclosed by the stress tests differently and these different interpretations may create more disagreements. However, we remark that in periods of distress i.e. during the European sovereign debt crisis, because of the high information need and the greater uncertainty, the stress tests results disclosure tends to decrease the split ratings.

Keywords: banks, stress tests, opacity, information disclosure, stockholders, bondholders, financial crisis, event study.