HOW DO RATING AGENCIES' DECISIONS IMPACT STOCK MARKETS? A META-ANALYSIS

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Abstract

The purpose of this study is to examine how the decisions made by credit rating agencies (CRAs) impact the stock market, using a systematic and quantitative review of existing empirical studies. More specifically, we employ a meta-regression analysis (MRA) to investigate the extent and nature of the effect of rating agencies' decisions on the stock market. We survey 62 studies published between 1978 and 2015. Our first finding is that the variation in reported estimates in primary studies is influenced by publication bias in favor of research that supports respectively a negative (positive) effect on the stock market when there is a negative (positive) rating event. Controlling for publication bias, the main findings of our meta-analysis indicate that negative rating decisions cause significant negative abnormal returns. This evidence suggests an informational effect. Our results also indicate that positive rating decisions do not have a significant effect. Finally, the MRA results reveal the importance of several factors related to primary study design, as well as to the nature and processing of data.

JEL codes: G14, G3

Keywords: meta-analysis, rating agencies' decisions, stock returns**,** event study

Fields of research: stocks markets, capital markets, market regulation, risk analysis, econometrics

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Introduction

Credit Rating Agencies (CRAs) have a long-standing history and are well-established institutions on the US market, yet more recently they have spread worldwide to become an essential component in both the functioning and regulation of all financial markets. Besides the big three (Standard & Poor's, Moody's and Fitch), a large number of other CRAs exist, some of which are dedicated to local markets only. As a result, the questions raised by the activity of these institutions, their role, and even their business model, have become a worldwide subject of concern, reinforced by the so-called "sub-prime crisis" at the end of the 2000s.

Indeed, in most instances, debt issuers pay CRAs to assess their own default risk through a qualitative rating. This rating may vary over time as the issuer's credit risk evolves. Consequently, the rating agency's decision is supposed to reflect such a change, and may either be negative (i.e., a downgrade) or positive (i.e., an upgrade). Furthermore, the agencies may take other rating decisions, such as moving an issuer onto a watchlist (also called credit watch). This type of rating event is less precise than a rating change, devised rather as information to announce a possible further rating change, in a positive or negative direction.

Rating decisions are assumed to be perfectly independent, although the agency is chosen and paid by the issuer. The credibility of CRAs relies heavily on this assumption of independence and is certainly one of the main reasons for the role allocated to these agencies in market regulation. For creditors, the rating information synthesized by the rating and provided by the CRAs is free, public and/or easily available. Rating agencies are also supposed to provide information to different stakeholders, and mostly stockholders. The question of the effective role of rating agencies, especially as information providers that may or may not hold private information, is frequently challenged, both from theoretical and empirical points of view.

In these recurrent debates, many event studies have been conducted over the past thirty years to evaluate the impact of rating agencies' decisions on financial markets. Their main aim is to assess the significance of the informational content of rating decisions.

On the stock market, most of these studies measure and test excess stock returns (also called abnormal stock returns) associated with the different rating events. The global market reaction is usually measured as an average, based on a sample of rating decisions, through cumulative average abnormal returns (CAARs) occurring over a period surrounding the rating event announcement. However, many of these studies give conflicting results that do not allow any robust conclusion to be drawn. It is difficult to compare these mixed results, which are implemented employing different scopes of research and methodologies. Consequently, meta-analysis is particularly useful to identify and quantify patterns, draw inferences from a range of results, and finally reach a global conclusion from the results of a large number of specific studies (Hunter and Schmidt 2004; Stanley and Doucouliagos 2012).

The purpose of this paper is to apply a meta-analysis to better understand and explain the role of rating agencies and the informational content of their decisions. The research aims to assess in more detail the relationship between the different specificities of studies that have already been published in academic literature and the

magnitude of the stock market reactions observed. To do so we make a comprehensive review of the econometrical estimates using meta-regression analysis (MRA), conducted on a sample of 62 articles published in academic journals, covering a publishing period from 1978 to 2015 and a large worldwide panel of countries. Therefore, the results of this meta-analysis should contribute to significantly reduce any doubts and uncertainties regarding the role of CRAs.
The paper continues as follows. Section 1 presents a brief discussion of the conflicting theoretical arguments and empirical issues in this literature. Section 2 describes the data used in the meta-analysis, and section 3 presents the methodology of the MRA approach. Section 4 discusses the MRA results. Finally, section 5 concludes the paper.

1 Theoretical background and empirical evidences

1.1 Rating agency activity and assessment of market reaction

Although considerable literature is dedicated to the financial market's reaction to rating changes, few authors deeply discuss the theoretical linkage between CRAs' decisions and security price changes. Indeed, most articles refer to theoretical assumptions previously highlighted in early stages of the literature on CRAs. Two different theoretical issues may be addressed: the first is the existence of a possible reaction to a rating event, and the second concerns the direction of the changes in market prices depending on the type of decision announced by a CRA. The conclusions on both aspects are sometimes contradictory according to the theoretical literature.

1.1.1. CRAs' decisions and informational asymmetry

Regarding the first issue, the main theoretical background mostly relies on a situation of information asymmetry between the different stakeholders (Jensen and Meckling, 1976). Under the assumption that ratings are well designed to properly assess the default risk of an issuer (Carey and Hrycay, 2001; Godlewski, 2007), the debate concerns "how much" and "what kind of" information is available to a CRA (Holthausen and Leftwich, 1986).

On the one hand, we may expect a rating agency to benefit from idiosyncratic knowledge (Millon and Takhor, 1985), especially on the intangible assets of a firm (Cornell et al., 1989), and more generally, the issuer could provide a CRA with private information that is not yet available to all investors operating on the financial market, and thus not yet included in the asset prices. In this context, and with reference to the principal-agent and the signal theory, rating agencies may be considered as mandated by the issuers to reduce the information asymmetry, to the benefit of investors. They are even sometimes depicted as the lowest cost-providers of information (Holthausen and Leftwich, 1986). Consequently, rating announcements may help improve market efficiency, and may induce changes on securities prices.
In this situation, i.e., under information asymmetry, agencies hold private information. A market reaction is expected in response to the rating announcement.
The signal theory is also useful to understand why the reaction on the stock market may be asymmetric, depending on the type of rating event: issuers are often more likely to deliver good information to the stockholders, rather than bad information. In other words, the disclosure of good news allows them to address a signal of quality to

investors, whereas they could be reluctant to do so in case of bad news. This behavior could explain that the informational content of a positive rating decision (*i.e.,* an upgrade or a positive watchlisting) may be weaker than that of a negative rating event (Holthausen and Leftwich, op. cit.). In addition to these arguments, Boot et al. (2006) also highlight that, besides assessing credit risk, CRAs play an important role in monitoring issuing firms, and allow investors' expectations to converge thanks to the public disclosure of rating revisions. The intensity of this monitoring and thus its informational content may also differ, depending on the nature of the event: for instance, Hand et al. (1992) suggest that CRAs may have an asymmetric loss function, in case of an assessment error.
In this context, we would expect a larger impact for downgrades than for upgrades.

On the other hand, some researchers argue that CRAs do not benefit from any comparative advantage in the capture of information: in practice, they would only have access to publicly available information (Wakeman, 1990), or would not monitor the issuers closely (Weinstein, 1977; Kaplan and Urwitz, 1979). Consequently, announcements of rating revisions should not affect asset prices (neither bonds nor stocks). Should a market reaction occur around the rating event, it would have been induced by the cause of the rating revision, rather than by the rating event itself. At best, in the latter case, CRAs may play a certification role, but would not provide any additional information to investors.
Under this hypothesis, we would observe either no reaction at the announcement, or a prior reaction. If a reaction occured in response to the rating decision, it would be associated with a confirmation of the information by the CRAs.

1.1.2. CRAs' decisions and potential conflicts of interest between shareholders and stockholders

Regarding the direction of changes in market prices in response to a rating event, it is necessary to differentiate any reactions occurring on the bond market from those occurring on the stock market. Although it is obvious that a downgrade is "bad news" for a creditor (and conversely for an upgrade) – suggesting a perceived increase (decrease) in the issuer's default probability –, the theoretical linkage between a rating revision and its possible effect on the stock market is unclear (Matolczy and Lianto, 1995). While the firm theory provides an insight into the conflict of interest between stockholders and creditors, and its possible resolution, it fails to clearly explain the effect of a rating revision (occurring on a bond), on the expected returns of a firm's stock. As reported by Creighton et al. (2007), most studies assume that information that is bad news for a creditor is also bad news for a stockholder. Consequently, a downgrade should be associated with a decrease in stock prices (i.e., with negative abnormal returns), and conversely with an upgrade. Such a hypothesis holds if the authors implicitly consider that a rating revision occurs when the CRA expects a change in the mean of the economic value of an issuing firm (i.e., the magnitude of future earnings and cash flows). Then, the value of the debt and that of the equity should logically change in the same direction (Holthausen and Leftwich 1986). Further studies also rely on this assumption (Dichev and Piotroski 2001; Kim and Nabar 2007; May 2010).
In this context, we can expect a positive reaction to upgrades and negative reaction to downgrades.

However, with reference to the contract theory, this pre-supposed linkage is challenged by the possible existence of contradictory effects on the situation of stockholders and bondholders (Watts and Zimmerman, 1986). The "wealth redistribution hypothesis" aims to explain the existence of opposite reactions to a rating change on bond and stock markets, thus reflecting contradictory interests between these stakeholders (Abad-Romero and Robles-Fernandez 2006). The first explanation refers to the situation where an issuer's downgrade is motivated by an increase in the firm's financial leverage. According to Goh and Ederington (1993), this will cause wealth to shift from bondholders to stockholders, leading to an expected fall in bond prices and a rise in stock prices. The second situation may occur when the reason for a downgrade is an increase in the variance of a firm's cash flows and earnings (the average value being constant). Following Merton (1974), different authors refer to the option theory to suggest that, *ceteris paribus*, the value of equity is expected to change in an opposite direction to that of debt (Holthausen and Leftwich, 1986; Zaima and Mc Carthy, 1988; Kliger and Sarig, 2000; Abad-Romero and Robles-Fernandez, *op. cit*.). Indeed, a stockholder may be viewed as holding a call option on the value of the firm, whose exercise price is the value of the debt. It is now well known that, all being equal, the value of a call positively depends on the volatility on the underlying asset. Consequently, this relationship could explain the presence of abnormal positive (negative) returns in case of a downgrade (upgrade). Moreover, Hand et al. (1992) explain that investors' reactions to the rating event will depend on whether they fully anticipated the agency's decision, or whether they were expecting a (less) more severe rating change. When market expectations are not entirely in line with the announcement, it is plausible to observe positive abnormal returns after a downgrade, and vice-versa.
According to this theoretical background, we may expect a downgrade on the stock market to have a positive impact, and conversely for an upgrade.

Finally, it is obvious that the theoretical background does not provide a clear, single relationship between the decisions made by CRAs and their incidence on stock market prices: the existence of a reaction, the timing and even the direction are questioned.

1.2. Empirical evidence and main hypotheses

A sizeable amount of empirical literature now assesses the impact of a rating event on the stock market. Most of the time, these assessments consist of event studies aiming to check for cumulative average abnormal returns (CAARs). Although stylized facts have apparently emerged over time, no consensual outcome can be drawn, either regarding the presence of CAARs induced by the rating event itself, or in terms of the direction and magnitude of stock price reaction.

1.2.1 Divergent conclusions in previous empirical studies

In case of a downgrade, although most studies highlight significant abnormal returns on the stock market at the announcement date (*i.e.,* Goh and Ederington, 1993; Beaver et al., 2006; Hirsch and Bannier, 2010), some authors document a significant reaction prior to the rating event (*i.e.,* Pinches and Singleton, 1978; Singh and Power, 1992; Purda, 2007; May, 2010) or no reaction at the date (*i.e.,* Wansley and Clauretie, 1985; Elyan, Maris and Maris, 1990; Singh and Power, *ibid*). These conflicting results call into question the accuracy of private information held by CRAs. In case of an upgrade, some authors confirm the absence of reaction induced by the rating event by pointing

out significant abnormal returns at the date of the event (Schweitzer et al. 1992; Elyan et al. 2003; Choy et al. 2006; May 2010).
Furthermore, an asymmetric reaction has been identified for negative and positive rating changes, with a negative reaction for downgrades and no reaction for upgrades (Holthausen and Leftwich, 1986; Hand et al. 1992; Dichev and Piotroski, 2001). Ederington and Goh (1998) argue that firms voluntarily release good news but are reluctant to disclose negative information, which induces bias towards negative information content of ratings and creates significant abnormal returns in the case of downgrades. Interestingly, some authors find that stock prices react in the opposite direction to what might be expected (Elyan et al. 1990; Gascock et al. 1990 Goh and Ederington, 1993). Moreover, some authors document reversal CAARs before and after the announcement (Glascock et al., 1987; Bi and Levy, 1993).

Note that the outcomes highlighted above mostly concern empirical studies of US stock markets. Over time, the enlargement of bond and stock markets, the spread of CRA activity outside the USA, the growing necessity for issuers to be rated, and the subsequent improvement in the availability of financial data have allowed other fields of investigation to emerge. In particular, studies focusing on other geographical areas have been implemented, firstly involving European countries such as the United Kingdom (Barron et al., 1997), France (Heude and Paget-Blanc, 2004), Spain (Abad-Romero and Robles-Fernandez (2006 and 2007), and Portugal (Pacheco, 2012); then the Asia-Pacific area: Japan (Behr and Gütler, 2008), Australia (Choy et al., 2006 ; Creighton et al., 2007), and New Zealand (Elayan et al., 2003); and more recently emerging markets (Parisi and Perez, 2000; Poon and Chan, 2008; Lal and Mitra, 2011). Most often, the features of these stock markets differ from the US, as regards size, liquidity and depth. Overall, these studies enrich and stimulate the discussion, but do not settle the debate.
Furthermore, some studies also focus on different kinds of events, such as watchlisting (Hand et al., 1992, Heude and Paget-Blanc, 2004, Chung et al., 2012;) while others deal with the reasons behind rating revisions (Goh and Ederington, 1999). Others look at a specific activity sector (Chandy et al., 1993, Gropp and Richards, 2001; Abad-Romero and Robles-Fernandez, 2006), or at different CRAs (Schweitzer et al., 1992; Iankova et al., 2009).

Finally, it is obvious that empirical studies still cast doubt on the role of CRAs as information providers to the stock market, and do not succeed in differentiating what really matters by explaining these conflicting results.

1.2.2. The potential of meta-analysis

While many methods have been developed to sum up a particular literature, meta-analysis represents the least subjective approach available today. Meta-analysis offers a set of quantitative techniques for integrating the results of a high number of individual studies. In meta-analysis, the researcher gathers all studies relevant to an issue, computes a summary effect and then assesses the consistency of the effect across studies. The main interest of meta-analysis is that it offers a systematic, objective approach for interpreting the results and identifying which factors are responsible for the difference among the existing empirical results. In this way, we can more accurately estimate the relationship between CRAs and stock returns, and enhance our understanding of why results vary across the published literature. Armed with the results of a meta-analysis, we are in a better position to identify trends and make inferences about the literature. In the next section, we will detail the data that we used to operate our meta-analysis.

2. DATA

The starting point for meta-analysis is the compilation of all published event studies that explore the relationship between rating changes and stock returns. To identify existing empirical studies, a literature search was conducted between May 2016 and August 2016. We started with a database search for relevant studies in EconLit, ISI Web of Science, Business Source Premier, Science Direct, Scopus and Google Scholar, using the following broad keywords: bond rating, credit rating agency, stock returns, excess returns, abnormal returns, stock prices, shareholder value, event studies, rating announcements, and rating changes. We also manually searched all of the academic journals that have published studies on bond rating (i.e., *Journal of Finance, Journal of Financial and Quantitative Analysis, Journal of Banking and Finance, European Journal of Finance, Journal of Financial Economics, The Financial Review, Journal of Economics and Finance*, etc.). Our search also included an examination of empirical studies for references to other studies that might report bond rating effects on stock markets. In order to be included in the meta-dataset, studies had to report an estimate that could be statistically analyzed. That is, event studies needed to report cumulative average abnormal returns (CAARs), sample size, standard errors and/or *t*-statistics. The papers that we analyzed include studies in academic peer-reviewed journals only. Following this process of elimination, we ended up with 62 studies between 1978-2015 on negative events and 53 on positive events containing respectively 1,252 and 857 estimates of the relationship between rating decisions and stock returns. All of these studies are listed in the Appendix (Tables A1 and A2), together with the country investigated, the data periods, the event windows, and the number of estimates per study.

All of the studies provide cumulative average abnormal returns (CAARs) associated with the announcement of a rating agency's decision. In this meta-analysis, the estimates of abnormal returns associated with a rating decision are used as observations and are combined to obtain an average CAAR. Following Stanley and Doucouliagos (2012), we chose to use all relevant CAARs reported in each of the studies. The advantage of using all CAARs is that it offers more estimates to explain the significant variability found across the different studies and between estimates. Furthermore, it does not contribute to any potential selection bias introduced by the meta-analyst. However, it does result in potential interdependence between data that must be accommodated by appropriate statistical tools (cf. infra).
Since authors usually report several windows in their event studies, we use all of the reported CAARs in each study whatever the event windows employed. However, we also created subsamples and aggregated the CAARs according to three window categories: before, around and after the event. These categories are used as one of several factors corresponding to the determinants hypothesized as influencing the stock return.

2.1. Descriptive statistics

Overall, the results of the existing studies vary. Table 1 indicates that 41% of the estimates are negative for studies examining the impacts of negative rating changes on stock returns, but 55% of the results are also insignificant, and only 4% of the estimates are positive and significant. On average, these findings indicate slightly negative abnormal returns (-0.2%), whereas an insignificant relationship is frequently observed (76%) for positive rating decisions. Hence, the existing literature provides mixed results regarding the financial market's reaction to bond rating changes. Meta-regression analysis is well suited to datasets with such conflicting results.

TABLE 1
Descriptive Statistics of Estimated Effects of Rating Agencies' Decisions on the Stock Market

	All windows Negative rating events		All windows Positive rating events	
	Number	%	Number	%
Number of studies	62		53	
Number of estimates	1,252	100	857	100
Negative and statistically significant	509	41	81	9
Negative and positive insignificant	688	55	655	76
Positive and statistically significant	55	4	121	14
CAAR				
Unweighted average	-1.866% (-2.086 to -1.646)		+0.396% (+0.151 to +0.636)	
Weighted average	-0.192% (-0.194 to -0.190)		+0.004% (-0.021 to +0.028)	

Notes: The unweighted average is the simple average of observations. The weighted average is calculated by using the inverse of variance as weights.

2.2. Funnel Plots

An interesting way of illustrating the distribution of the reported estimates is to construct a funnel plot. A funnel plot is a scatter diagram of all empirical estimates of a given phenomenon in which the size of the estimated effect is plotted on the *x*-axis against a measure of the estimate's precision (i.e. the inverse of the estimates' standard errors, 1/SE) plotted on the *y*-axis. The funnel plot also provides a simple tool for visualizing possible publication bias (Stanley and Doucouliagos 2010). Publication bias is a subtle form of bias in empirical research arising when the selection of studies for publication is made based on the statistical significance of results and/or on whether the results satisfy preconceived theoretical expectations (Doucouliagos et al. 2005). In the absence of publication bias, the effect size should be symmetrically distributed around the 'true' value of the effect. Empirical estimates with less precision are more widely spread at the bottom of the graph, while more precise estimates are found at the top of the funnel.

FIGURE 1 Funnel Plots of Estimates of Rating Agencies' Decisions on the Stock Market

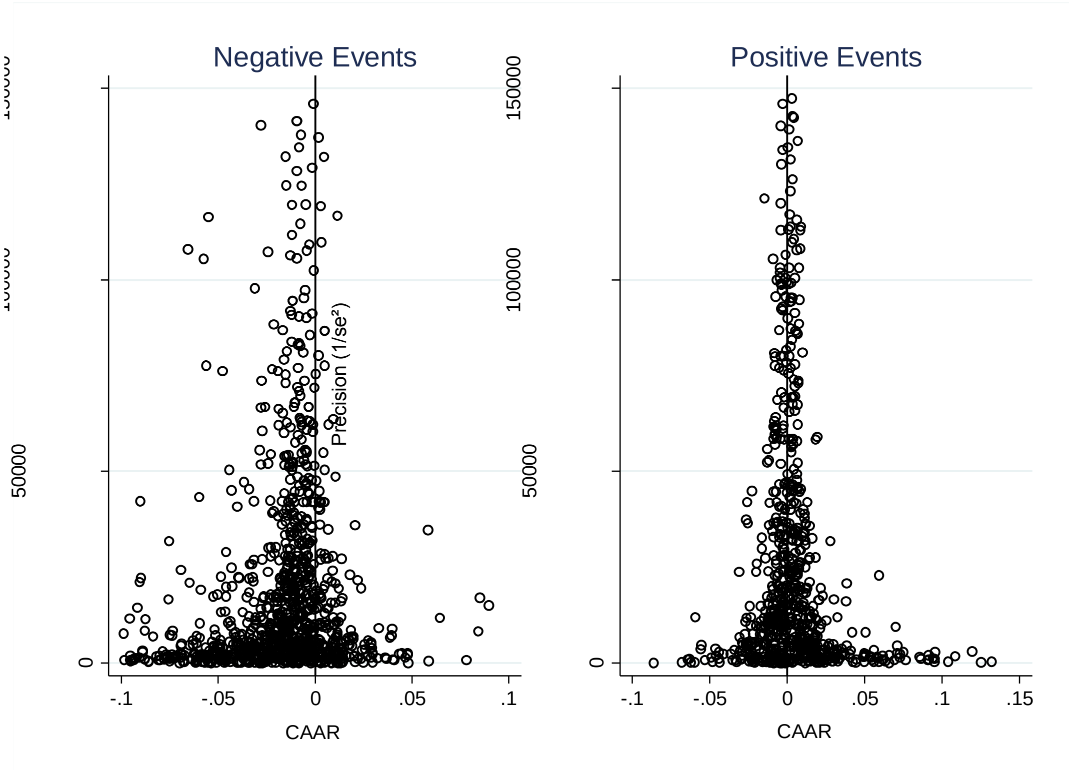

Figure 1 depicts funnel plots of CAARs of the effects of rating decisions on stock returns. The funnel plot on the left illustrates the distribution of the results for negative rating decisions whereas the funnel plot on the right presents the distribution of the results for positive rating decisions. While the funnel graph on the right appears to be symmetrical, suggesting the absence of publication bias, the funnel plot on the left represents a slightly negative skew in the distribution. This indicates a preference for reporting negative effects in the literature examining the impact of the announcement of negative rating events on stock returns. This is particularly true for rating actions that cause negative abnormal returns before and around the date of the announcement (see Figure A1 in the Appendix). Although these results point toward publication bias for negative rating decisions, the main drawback of the graphical analysis is the assumption of a single "true" effect, which holds for all studies regardless of the underlying study design. Hence, if the "true" effect is heterogeneous across time periods, countries and industries, for instance, a skew in the distribution can also be a result of the study design and does not necessarily reflect publication bias. Consequently, it will be useful to adopt an MRA approach to address heterogeneity across studies (Stanley and Doucouliagos, 2012).

3. META-REGRESSION ANALYSIS (MRA) METHODOLOGY

3.1. MRA Procedure

The MRA was performed in two steps. First, the data were tested for the presence of publication selection bias. When this is present, there is a positive association between the reported effect and its standard error; otherwise, estimates and their standard errors are independent (see Stanley and Doucouliagos, 2012, for more details). Hence, we explored the presence of publication bias by estimating the following model:

$$CAAR_{ij} = \beta_0 + \beta_1 SE_{ij} + \varepsilon_i \qquad (1)$$

Where *CAAR* is the cumulative average abnormal return, *SE* is the standard error of the cumulative average abnormal return, β_0 and β_1 are parameters to be estimated, *i* and *j* denote the *i*th estimate from the *j*th study, and ε are the residuals. Equation (1) is known as the Funnel Asymmetry-Precision Effect Test, or FAT-PET (Stanley 2005, 2008), and provides a test of funnel asymmetry that is consistent with publication selection bias. If β_1 is statistically different from zero then we can consider that there is publication bias. Estimates of β_0 provide an unconditional measure of the genuine empirical effect of rating decisions corrected for any publication selection bias (Stanley 2008; Stanley and Doucouliagos 2012).

The second step was to estimate an MRA model to investigate the heterogeneity of reported research results:

$$CAAR_{ij} = \beta_0 + \beta_1 SE_{ij} + \sum \beta_k Z_{ki} + \varepsilon_{ij} \qquad (2)$$

where *CAAR* denotes the cumulative average abnormal return, *SE* is the standard error of the cumulative average abnormal return, *Z* is a vector of moderator variables, and ε is the disturbance term. Equation (2) is used to identify the factors that create heterogeneity in reported estimates. Some of this heterogeneity will reflect real moderators, but some will be created by research design choices. Heterogeneity can be identified and quantified by the *Z* vector in Equation (2). In other words, the abnormal returns from previous studies are used as observations in a multiple regression model, with independent variables corresponding to the factors hypothesized to influence stock returns (Datta et al, 1992). The moderator variables used to explore genuine heterogeneity and heterogeneity introduced by research design choices are listed in Table 2 below. Different types of moderator variables are hypothesized to influence the estimated effect of rating changes: variables capturing measurement and definitions, variables capturing model specification and estimation, and study-specific variables. All of them are based on the data available in primary studies.

3.2. Factors explaining how the decisions made by credit rating agencies (CRA) impact stock returns

We built three sets of independent variables to be included in the meta-model, which are summed up in Table 2.
The first one relates to the timeliness of the reaction on the stock market.
One of the main theoretical issues is the dating of the reaction, illustrating whether or not CRAs are able to provide useful information. Although theoretical literature suggests that a reaction can occur on the stock market prior to an announcement by a credit rating agency, there is no empirical consensus to determine which event window

has to be taken into account to capture CAARs prior to the rating decision. Most studies aim to highlight abnormal returns "at the date" of the rating event, or "immediately after", to assess the timeliness of the response to information conveyed by the rating agencies, although some also focus on a post-event window of variable length. In addition, some authors decide to present their results by taking into account a "hybrid" event window, where CAARs are estimated simultaneously on a pre-event and a post-event period. These must be interpreted as a cumulative effect on a whole period surrounding the rating announcement. In our meta-model there is therefore no good reason to favor one period over another. We built three dummy variables to check for the timeliness of the reaction. The AFTER variable (the reference dummy) is set to start at the date of the announcement, and aims to capture an effect with perfect knowledge of the rating event. Conversely, the BEFORE variable equals 1 when the authors presented event studies with estimated CAARs prior to the rating announcement. Thus, in our meta-model, the coefficient shall be interpreted as an additional effect (positive or negative) on the stock market, compared to that occurring with knowledge of the rating decision. Finally, the AROUND variable aims to synthesize the effect on the "hybrid" period, and equals 1 for all of the results presented in primary studies over a period surrounding the rating announcement. The estimated coefficient in the meta-analysis is also read as an additional effect, compared to the reference dummy.

The second set of determinants included in our meta-model concerns the definition of the scope of the studies chosen by the authors. We defined five types of variables:

- *Creditwatch versus rating changes*

The first variable, whose effect will be discussed, is the type of rating event that has been taken into account in the different studies published over time. Very often, authors have separated the inclusion of an issuer on a watchlist from rating changes, with the assumption that the signal addressed to the market was more important for watchlisting (Hand et al. 1992; Followill and Martell 1997; Norden and Weber, 2004). To deal with this question, and considering the rating change as the reference, we built two different dummies: WATCHNEG equals 1 if estimates of the CAARs relate to negative watchlisting, and WATCHPOS equals 1 if estimates relate to positive watchlisting. The coefficient of each of these two dummies shall be interpreted as the possible additional effect (positive or negative) of including an issuer on a watchlist, rather than changing the rating, respectively with a downgrade or an upgrade.

- *Countries and financial market differences*

To capture potential differences between countries and studied markets, three dummies were constructed for studies concerning respectively the American market (USA), other developed country markets (DEVOUT), and emerging country markets (EMERGING). In the meta-analysis, the USA was used as the reference, so that the other two coefficients must be interpreted as an additional effect, compared to the US stock market reaction.

As the financial markets and the situation of the rating industry vary considerably across countries, we hypothesized a potential different impact in terms of market reaction to agencies' rating decisions.

In a slightly simplistic representation, we have, on one hand, the situation in the USA: a mature market and a prominent rating industry, an extensive history of rating activity, and well-established CRAs. On the other hand is the situation in some emerging

countries, with recent financial markets, newly established rating agencies and, often, a rating industry that is still not stabilized. The stock markets of developed countries other than the USA (such as European markets) are situated between the two, although broadly closer to the American model, despite the fact that the role assigned to the markets in financing the economy is smaller.
Consequently, we might expect the CRAs' decisions to be more closely considered by investors on a mature market featuring experienced, stable, well-known agencies, rather than on more recent markets with a developing rating industry.

- *The incidence of local rating agencies*

It is well known that the global rating industry is by far dominated by the three major international agencies (Standard and Poor's, Moody's, Fitch), which is often described as a global oligopolistic situation. However, almost all markets feature other agencies (i.e. domestic or local), some of which are completely independent while others are linked to a major agency through a joint venture or other agreements. The debate between local and international agencies has been going on for a long time, with mixed consequences. On the one hand, domestic agencies are supposed to have better knowledge of local issuers and their economic context, and be better placed than international agencies to adapt to specific local features. On the other hand, international agencies are supposed to have more experience and greater expertise in the rating process. They are also often seen as being more independent, resulting in greater resistance to conflicts of interest, in particular with the issuer itself or local authorities.
In this regard, almost all primary research uses rating decisions from the major CRAs (either one, two or all three majors together), whereas none of them refer to local agencies only. To deal with this issue, we operate a distinction between primary studies that take into account major and local agencies, and those grounded on a sample integrating only major agencies. The LOCAL dummy that has been created shall be interpreted with respect to these two main alternatives (the latter being the reference).

- *Industry specificities consequences*

Most primary research studies present global results without any sectoral distinction. However, such a distinction exists in two cases. Firstly, when the authors choose to refine their global results with estimates based on different sectors of activity. Secondly, when the study focuses on a specific industry (e.g. finance or real estate industries).
In this meta-analysis, two dummies allow us to deal with this question: SECTFBA for results of studies relying on the financial sector (including banking and insurance) and SECTNOFIN for all non-financial industries. Their estimated coefficients shall be interpreted with respect to the reference, which are the global results of the primary studies with no sectoral distinction.

- *Market reaction over time*

Rating event studies have been carried out for more than 30 years. The period of study covered by the different empirical analyses is a crucial one, for it synthesizes other evolutions. For instance, we may expect the disclosure of financial information to investors to have improved over time (due to e.g. technological innovation, changes in regulatory requirements and the competitive environment), which suggests the informational content of rating announcements could be lower in recent periods, reducing the probability of a market reaction after a rating event. On the contrary, we

might also argue that CRAs have spread their influence over time (due to international joint-ventures or other restructuring schemes or due to Basel 2 and 3 regulatory disposals), and now operate extensively throughout the world. Therefore, this evolution could reinforce the probability of a reaction on the different stock markets.
In this meta-regression, the TEMPORAL dummy is designed to capture a possible evolution in market reactions over time, by comparing study results between two sub-periods, before and after 2003 (the reference being “after”).

Finally, the third set of independent variables deals with methodological issues. Three of these have been included in our meta-analysis.
The first one focuses on data contamination. More specifically, a contamination may occur on the day of the rating announcement, or around then, for different reasons. Firstly, the rating decision of a specific agency may be accompanied by the disclosure of other strategic information about the issuer (e.g. from other CRAs, or financial analysts). This kind of parallel information can disrupt the reaction of the market over the event window. Contamination, when occurring over the estimation period, may also affect the process of calculating the parameters that are used to assess the existence of CAARs.
Three situations are generally observed in primary studies. Considering the complexity of sample decontamination, authors who decide to do so clearly describe this procedure. In doing so, they give more weight and credibility to the results of their empirical tests. Conversely, given the difficulty and lack of information, others explicitly decide not to clean their samples. The third possibility is that authors voluntarily avoid mentioning in their article any details about a possible decontamination procedure. Therefore, they assume that a potential contamination phenomenon would not affect the results. To deal with this in our meta-analysis, the CLEAN dummy variable allows us to distinguish primary studies that explicitly give information about cleaning the sample from those that do not give any information or do not take into account a possible contamination (the reference dummy).

The second methodological variable included in our meta-analysis is the size of the sample in the primary study. This can depend on a methodological choice made by an author to focus on a specific geographical area or on a specific sector of activity not yet studied in previous literature, or, because of the recent development of the financial market, to focus on the growing activity of CRAs in some countries. However, the sample size can also be considered as a methodological constraint, in that, in such analyses, it will be smaller than for an event study focusing on a mature market, such as the US bond market, for instance. Whatever the situation, the sample size may influence the market response to a rating announcement. In our meta-analysis, the SAMPLESIZE dummy has a value of 1 for samples smaller than 50.

Finally, the third and last methodological variable in our meta-analysis deals with the choice made by some authors to use non-parametric tests to complete the traditional empirical parametric tests of cumulative average abnormal returns. In practice, once CAARs are observed, their significance has to be validated with appropriate statistical tests. In all published papers relying on an event study methodology, the authors use parametric tests, i.e. a Student test. Others implement additional nonparametric tests to search for a reaction, and simultaneously, to improve the relevance of the results and the scientific quality of the analysis, for later publication. In our meta-model, the coefficient of the NOPARAME dummy aims to assess the difference of the market reaction in studies that simultaneously use parametric and non-parametric tests, compared to the reference (parametric tests only).

TABLE 2
Variable definitions and summary measures

		Sample of Negative rating decisions		*Sample of Positive rating decisions*	
Moderator variables		*Mean*	*sd*	*Mean*	*sd*
SE	Standard error of the CAR	0.021	0.070	0.017	0.033
Group 1: Data characteristics					
SECTNOFIN	= 1 if estimates are for specific industries (except financial sector)	0.133	0.339	0.145	0.352
SECTFBA	= 1 if estimates are for the financial sector (including banking and insurance)	0.137	0.344	0.124	0.329
SAMPLESIZE	= 1 if the sample size is less than 50 observations	0.534	0.499	0.575	0.495
WATCHNEG	= 1 if estimates relate to negative watchlisting	0.113	0.317		
WATCHPOS	= 1 if estimates relate to positive watchlisting			0.120	0.325
LOCAL	= 1 if estimate relates to at least one local agency	0.091	0.287	0.107	0.310
Group 2: Spatial and temporal issues					
TEMPORAL	= 1 if the study used observations before 2003	0.665	0.472	0.630	0.483
USA	= 1 if the study used US data (used as the base)	0.399	0.490	0.414	0.493
DEVOUT	= 1 if the study used data from developed countries (including Europe but excluding USA)	0.498	0.500	0.451	0.498
EMERGING	= 1 if the study used data from emerging countries	0.103	0.304	0.135	0.342
Group 3: Econometric issues					
CLEAN	= 1 if the study is explicitly decontaminated	0.454	0.498	0.418	0.493
NOPARAME	= 1 if the study used non parametric tests	0.348	0.477	0.369	0.483
WBEFORE	= 1 if estimate relates to ante event window	0.316	0.465	0.296	0.457
WAFTER	= 1 if estimate relates to post event window	0.301	0.459	0.377	0.484
WAROUND	= 1 if estimate relates to an 'hybrid' (around) event window	0.383	0.486	0.327	0.469

3.3. MRA econometric issues

The estimation of the MRA model involves dealing with several econometric issues. First, the dependent variables consist of estimations with heterogeneous variances leading to heteroskedastic error terms. However, as SE is a measure of heteroscedasticity, weighted least squares (WLS) with a weight of $1/se^2$ can be used to provide corrected standard errors (Stanley, 2005; Stanley and Doucouliagos, 2012). Second, as our sample includes clusters of estimates from the same studies, the issue of correlated error structure within these clusters needs to be dealt with. Therefore, we estimate the MRA models using WLS combined with an approach to account for study-related dependence of standard errors. Following Stanley and Doucouliagos (2012), we use cluster robust standard errors to account for nonzero correlation between the errors of estimates from the same study. We also use panel estimators to account for within-study error dependence. However, conventional random and fixed estimators are outperformed by WLS due to a lower bias if publication selection exists (Stanley and Doucouliagos, 2013). Hence, we will focus on the estimation based on WLS and will apply panel estimator (multi-level models) as sensitivity analysis and robustness checks of the WLS results. Finally, the meta-analysis literature includes discussion about fixed- and random-effects estimators (FEEs and REEs). FEEs assume that all reported estimates are drawn from the same population with a common mean. However, there is generally no reason to assume that they are "identical" in the sense that the "true" effect size is exactly the same in all of the studies. Rather than assuming the existence of one "true" effect, we can allow for a distribution of true effect sizes. Therefore, the combined effect does not represent the one common effect, but rather represents the mean of the population of true effects. The approach of a random-effects (REE-WLS) analysis is to decompose the observed variance into its two component parts, within-studies and between-studies, and then use both parts when assigning the weights ($1/se^2$). In this meta-analysis, we consider that the REE provides the best estimates of the population effect (Hunter and Schmidt, 2004).

4. RESULTS

4.1. FAT-PET Analysis

Table 3 provides the estimates of Equation (1). Panel A reports the results for negative rating decisions (downgrades and inclusions on a watchlist). Column 1 presents the results using OLS with robust standard errors. However, since we have multiple estimates from each study, data dependence might be an issue. Hence, column 2 reports the results after correcting for data dependence using clustered standard errors. In column 3, we use weighted least squares (WLS) employing inverse of variance as the weight, as suggested by Hedges and Olkin (1985). WLS gives more weight to more precise estimates. In panel A, column (3), the standard error (SE) coefficient is significant and negative. Hence, we can conclude that there is significant selection bias in this literature. Panel B reports FAT-PET analysis for meta-data from studies that examine the effects of positive rating events on stock returns. The standard error coefficients are non-statistically significant. The conclusions drawn from this panel are that there is no significant selection bias in this literature.

The slight distortion of the appearance of the funnel plot is confirmed by this formal statistical test. In other words, we find evidence of a negative publication bias as suggested previously by the funnel plot in Figure 1 on the left, which is slightly distorted in the left-hand side.
As estimates of β_1 serve to correct publication bias (see Stanley and Doucouliagos 2012; 60–61), column 3 of Table 3 reports the weighted meta-average CAAR corrected for publication selection bias. The FAT-PET weighted averages suggest a negative and slightly statistically significant impact of negative rating decisions on stock returns (*CAAR* = −0.2%***, p <0.01). However, it is important to note that these FAT-PET models provide unconditional estimates, i.e. simply an expected mean value without any conditioning set of other variables that can explain this mean.

TABLE 3 FAT-PET

Cumulative average abnormal return and rating decisions, unconditional estimates

	OLS Robust (1)	OLS clustered (2)	WLS & clustered (3)
A. CAAR (Negative rating decisions)			
SE	0.014	0.014	-0.763***
	(0.89)	(0.37)	(-4.14)
Constant	-0.019***	-0.019***	-0.002***
	(-16.04)	(-6.83)	(-4.47)
Observations	1,232	1,232	1,232
Adj. R-squared	0.001	0.001	0.130
B. CAAR (Positive rating decisions)			
SE	0.057	0.057	0.247
	(1.51)	(0.38)	(1.07)
Constant	+0.003**	+0.003	-0.001
	(2.09)	(1.21)	(-0.91)
Observations	844	844	844
Adj. R-squared	0.002	0.003	0.016

Notes: All columns report estimates of equation (1). Figures in brackets are *t* statistics. ***p <0.01; **p <0.05

4.2. Meta-analysis regressions results

The MRA results are presented in Table 4. We use cluster data analysis to adjust standard errors for data dependence arising from multiple estimates reporting within studies. All observations are weighted by precision. That is, all models are estimated by weighted least square (WLS). Columns 1–3 present the estimation results for studies examining the effect of negative rating events on stock returns. Columns 4 – 6 report the results for studies dealing with positive rating decisions.
Columns 1 and 4 report the baseline OLS results for comparison purposes only. In columns 2 and 5, we use a 'random-effects' MRA, including an additional term to the MRA model that allows for any between-study random variation. WLS random-effects models are one method of addressing within-study dependence (Stanley and Doucouliagos 2012). An alternative means of dealing with any data dependence is to estimate a multi-level, linear hierarchical model, estimated using restricted maximum likelihood (REML). These results are reported in columns 3 and 6. As suggested in part 3.3, the discussion that follows addresses the results in columns 2 and 5. The MRA captures the heterogeneity in reported estimates reasonably well. The MRA explains about 26% of the variation of the CAARs (see the adjusted R-squared, column 2, Table 4). Table 4 shows that the MRA coefficients are for the most part rather consistent across the various models.

Globally speaking, our meta-analysis confirms that the stock market reaction is more sensitive to negative rating events than to positive ones. Thus, the overall estimated effect is -1.71% in case of negative rating decisions, whereas no significant CAARs are noticed for positive decisions (table 5 or 6). However, these meta-average effects have to be clarified and supplemented in light of different determinants.

TABLE 4

Rating Decisions and Shareholders' Value, meta-regression analysis

	Negative Events			Positive Events		
	OLS Robust (1)	REE-WLS (2)	REML Multi-Level (3)	OLS Robust (4)	REE-WLS (5)	REML Multi-Level (6)
SE	0.0101	-0.714***	0.0154	0.0291	0.255***	-0.0202
	(0.30)	(-8.90)	(1.10)	(0.22)	(3.22)	(-0.60)
WATCHNEG	0.00949**	0.00700***	0.00495			
	(2.05)	(3.10)	(1.14)			
WHATCHPOS				0.0232**	0.00938***	0.0228***
				(2.56)	(5.17)	(4.90)
WBEFORE	-0.0236***	-0.0144***	-0.0210***	0.0164***	0.00484***	0.0139***
	(-3.92)	(-8.47)	(-8.74)	(3.03)	(4.69)	(5.26)
WAROUND	-0.0199**	-0.0163***	-0.0189***	0.00208	0.00163*	0.00271
	(-2.13)	(-9.05)	(-6.78)	(0.43)	(1.66)	(0.89)
EMERGING	0.0236**	0.0220***	0.0294**	0.00140	-0.00145	0.00321
	(2.44)	(7.06)	(2.54)	(0.29)	(-0.97)	(0.29)
DEVOUT	0.0125**	0.0106***	0.0279***	-0.00491	-0.00121	-0.0000
	(2.17)	(5.81)	(4.37)	(-0.97)	(-1.08)	(-0.00)
LOCAL	-0.00324	-0.00176	0.000813	0.0177*	0.00440***	0.00425
	(-0.41)	(-0.67)	(0.13)	(1.89)	(3.40)	(0.70)
SECTNOFIN	0.0106*	0.0115***	0.00695*	-0.00570	-0.00166	0.00146
	(1.81)	(4.87)	(1.85)	(-1.29)	(-1.39)	(0.34)
SECTFBA	0.00512	0.00370	0.00286	-0.00528	-0.000912	-0.00125
	(1.20)	(1.64)	(0.65)	(-1.36)	(-0.66)	(-0.25)
TEMPORAL	0.0109*	0.00597***	0.00932	0.00320	-0.0000847	0.00382
	(1.71)	(3.27)	(1.10)	(0.86)	(-0.08)	(0.38)
CLEAN	0.00644	0.00268*	0.00152	-0.00602*	-0.000718	-0.000359
	(1.58)	(1.84)	(0.45)	(-1.72)	(-0.83)	(-0.10)
SAMPLESIZE	0.00201	0.00356**	-0.00169	-0.00563	-0.00131	0.00126
	(0.39)	(2.14)	(-0.44)	(-1.18)	(-1.18)	(0.30)
NOPARAME	-0.00104	-0.00186	0.00310	0.00224	-0.00232**	-0.00625
	(-0.16)	(-1.06)	(0.35)	(0.44)	(-2.33)	(-0.54)
Constant	-0.0276***	-0.0157***	-0.0300***	-0.000435	-0.000336	0.00108
	(-4.92)	(-6.58)	(-3.28)	(-0.11)	(-0.27)	(0.10)
N	1,232	1,232	1,232	844	844	844
Log Likelihood			2,390.43			1,714.77
Adjusted R^2	0.123	0.261		0.126	0.163	

Notes: See Table 3 for variable definitions and summary statistics. Figures in brackets are *t*-statistics using standard errors adjusted for clustering. Columns 1 and 4 present the baseline OLS estimates. Columns 2 and 5 are the random effects weighted least squares using weights = $(1 / se^2 + \tau^2)$, where τ^2 is the estimate of random effects variance (the between-study or heterogeneity variance). Columns 3 and 6 report the multi-level (REML) estimates

.4.2.1. Timeliness of the market reaction

It is interesting to note that, on average, the reaction is always more intense over a period with no knowledge or imperfect knowledge, compared to a period with full knowledge of the rating event (Table 6). Indeed, the magnitude of the overall effect on the stock market is greater on the event window located prior to the announcement (BEFORE variable) or surrounding the rating event (AROUND variable). This fact is confirmed with significant estimated coefficients for these two dummies, compared to the reference (Table 4)

While this remark holds for both positive and negative events, it is also interesting to note that a significant reaction continues once the announcement of a negative rating decision is known, whereas there is no more effect in case of a positive rating decision (Tables 4 and 6).

Regarding the financial theory, these results help to clarify the information brought by CRAs and the role they could play in improving (or not) stock market efficiency. The doubt already expressed in some of the literature regarding CRAs' capacity to convey idiosyncratic and useful information to investors through upgrading or positive watchlisting is thus confirmed. The publication of this good rating news does not result in a reaction on the stock market. In case of downgrading or negative watchlisting, although most of the reaction occurs before the announcement, our conclusion is that CRAs still convey information to the stock market, which allows their certification role to be confirmed.

TABLE 5
Meta-average – Random Effects

	All countries	US	Europe + other developed countries (except US)	Emerging countries
I. Estimated Effects of Negative Rating Decisions				
CAARs	**-1.71%*****	-2.31%***	-1.06***	-0.68%**
	(-7.85)	(-9.98)	(-4.06)	(-2.18)
II. Estimated Effects of Positive Rating Decisions				
CAARs	**+0.08%**	+0.14%	-0.05%	-0.02%
	(0.77)	(1.28)	(-0.30)	(-0.12)

Notes: Figures in brackets are *t*-statistics using cluster adjusted standard error. All estimates use coefficients from columns 2 and 5 of Table 4.

TABLE 6
Meta-average – Random Effects

	All countries	Event Windows		
		Before	Around	After
I. Estimated Effects of Negative Rating Decisions				
CAARs	**-1.71%*****	-2.46***	-2.12***	-0.82***
	(-7.85)	(-9.97)	(-8.77)	(-3.60)
II. Estimated Effects of Positive Rating Decisions				
CAARs	**+0.08%**	+0.44%***	+0.06%	-0.11%
	(0.77)	(3.43)	(0.50)	(-0.91)

Notes: Figures in brackets are *t*-statistics using cluster adjusted standard error. All estimates use coefficients from columns 2 and 5 of Table 4.

4.2.2. The effect of the "scope of the studies"

- *Creditwatch versus rating change*

Although previous theoretical and empirical literature has debated whether creditwatch is a more informative announcement than a rating change, our meta-analysis helps to identify the magnitude of the reaction to these two types of events, which turns out to be different for positive and negative rating announcements.

More precisely, the results highlight that, *ceteris paribus*, the magnitude of the stock market reaction is greater following a positive watchlisting (with positive CAARs) than for upgrading (i.e., the significant coefficient of the WATCHPOS dummy, Table 4). Conversely, the impact on the stock market, expressed as negative CAARs, is greater in case of a downgrade than a negative watch (i.e., the significant negative coefficient of the WATCHNEG dummy, Table 4). This *a priori* contradictory effect may be understood with reference to the financial theory. The incidence of a "bad rating event" is always considered as bad news for bondholders (and vice-versa), whereas it is not so clear for stockholders (cf. part 1).

If we first consider "good rating events", different reasons may be provided to explain the greater effect of a creditwatch compared to an upgrade. We mentioned (cf. 1.1.1) that issuers are more likely to communicate good news to the investors early and by themselves, rather than waiting for a rating agency to upgrade their rating. Second, in line with the signal theory, we may also hypothesize that the credibility of a rating agency might be more affected in case of omitting to announce an increase in the issuer's default risk, rather than omitting to inform of a decrease. Consequently, the frequency of publishing a positive watchlisting should be relatively low, and thus should be *a priori* considered as a reliable signal, as soon as it is ascertained from the stockholders. All together, it is obvious that an investor is encouraged to react as soon as possible to good news and to buy the issuer's stock, "prior to" or "around" a creditwatch, and surely not to wait for good news to be confirmed by further upgrading. This behavior may be the cause of the greater effect of a positive creditwatch.

Symmetrically, for "bad rating events", financial theory underlines that issuers have no incentive to communicate bad news early (cf. 1.1.1). They are rather encouraged to wait for a CRA to reveal it to the market. However, theory also suggests that the effect of a negative rating event is not always "bad news" for stockholders, for it depends on the reason behind this rating event, and on the severity of the sanction (cf. 1.1.2, the wealth redistribution hypothesis). Such information is expected to be better detailed and conveyed at the announcement of a downgrading rather than at the time of watchlisting. In addition, a CRA's credibility may be more affected if it omits announcing an increase in the issuer's risk, rather than communicating too quickly about it, which is an incentive to easily use negative watchlisting as a vector of information. Finally, we can deduce that the informative content of a negative creditwatch is weaker than a downgrading, which could explain the lower magnitude of the negative reaction observed on the stock market.

- *Financial market differences*

Regarding the two dummies, DEVOUT and EMERGING, the meta-analysis gives contrasted but clear and highly consistent results (Tables 4 and 5).

Whatever the country, no significant estimated effect is observed (Table 5) for positive events. In the meta-regression analysis (Table 4), none of the coefficients of these two

variables is significant. This means that there is no significant difference in the stock market reaction to positive rating decisions between the American market and, respectively, other developed countries and emerging countries. The same conclusion, (i.e., the lack of reaction) can be drawn in each of these three areas.
In contrast, the results from the meta-regression to negative rating decisions are quite different (Table 4). Both dummies have highly significant and positive coefficients, with a much higher value for emerging countries than for developed ones. Considering that the global meta-effect of negative decisions for all of the countries is negative (Table 5), we can highlight the positive values of the coefficients EMERGING and DEVOUT. Both clearly indicate a weaker negative effect in the emerging or other developed stock markets, compared to the impact on the American one. In other words, the further the rating decision is from the American marketplace, the lower the reaction on the stock market.

All in all, the meta-regression estimates expressed in Table 4 are consistent with the global effects observed in Table 5, Both indicate a considerable negative reaction to negative rating decisions in USA, a significant negative but smaller response in other developed markets, and an even smaller one in emerging countries. They all point to the same result in case of a positive rating decision, i.e. no response, whatever the market place. These findings confirm that CRAs do not hold or convey any specific information to investors when they decide on an upgrading or positive watchlisting. However, they continue to play a role in evaluating the increase in an issuer's default risk, bearing in mind that their contribution to reducing the information asymmetry is more effective on the US stock market than on the other ones.

- *The effect of local CRAs*

The LOCAL dummy also leads to contrasted conclusions, comparing positive and negative rating decisions (Table 4). For positive events, we observe a highly significant positive coefficient with a low value (0.0044). Given that there is no global effect of positive rating decisions (Table 5), the only comment to be made is that primary papers that also integrate some local rating agencies into their field of study are more likely to exhibit a greater positive significant reaction than those focusing on the three major CRAs. This suggests that the informational content of the local agencies' decisions could be higher, either because of their greater reactivity, or because they are more able to reduce the information asymmetry on the stock market they operate on.
In contrast, for a negative event, the dummy coefficient remains non-significant, bringing us to the conclusion that the same global negative impact of negative decisions exists, whatever the CRA.

- *Sectoral specificities*

For positive rating events, neither of the two dummies SECTNOFIN and SECTFBA has a significant coefficient (Table 4). This suggests that there is no significant difference in the results, comparing primary research focusing on specific sectors with studies considering all sectors of activity. Given that positive events have no real impact on the market (Table 5), this conclusion also prevails, whatever the industry.
For negative rating decisions, the significant positive coefficient of the SECTNOFIN dummy must be highlighted, whereas that of the SECTFBA variable remains insignificant (Table 4). As the global effect of negative rating decisions is negative (Table 5), it leads to the conclusion that the magnitude of the effect is not different when such rating events concern the financial sector, in comparison with the

conclusion prevailing in studies that do not differentiate sectors of activity. In contrast, the significant positive coefficient associated with the SECTNOFIN variable can be interpreted as a slightly weaker reaction in the financial sector (with a low value of 0.0115), while remaining negative.

- *The market reaction over time*

The coefficient of the TEMPORAL dummy is not significant for positive rating decisions and highly significant and positive in terms of negative ones (Table 4).
Given that positive events have no overall impact on the market (Table 5), this lack of influence prevails, whatever the sub-period considered. However, as negative events globally have an estimated negative effect on the stock markets (Table 5), this significant and positive coefficient leads to the conclusion that the reaction is more negative over the second sub-period (after 2003). This result confirms the assumption (cf. part 3.2) that the influence of CRAs on the stock markets is still growing.

4.2.3. Methodological issues

Concerning data contamination, for positive events we observe no significant coefficient for the CLEAN dummy variable (Table 4), which leads to the same conclusion (i.e., the lack of reaction, cf. Table 5), whether or not data are contaminated. On the contrary, for negative events, the coefficient is positive and significant, thus highlighting the importance of a data decontamination step. This reflects a weaker reaction for decontaminated samples, bearing in mind that this comment has to be weighted against the low value of the estimator and the fact that the decontamination procedure may be different according to the author, and not always detailed.
Regarding the sample size, the insignificant coefficient of the SAMPLESIZE dummy variable (Table 4) for positive events, confirms the market's weak reaction regardless of the number of data included in the study. By contrast, considering the negative rating events, this coefficient is significant and positive. This result confirms a weaker market reaction for small samples, whilst remaining negative.
The results relative to the use of non-parametric tests in primary studies are mixed. Whereas for positive events the coefficient of the variable (NOPARAME) is negative and significant, we observe a non-significant coefficient for negative events (Table 4). When a market reaction to negative events exists, non-parametric tests do not provide additional information to the standard parametric tests. Indeed, the magnitude of the reaction is great enough to be statistically significant with the sole implementation of parametric tests.
Moreover, as little reaction is expected in the case of positive events, the negative coefficient of the dummy means that studies that also implement nonparametric tests reveal a lesser market reaction than those using parametric tests only.

To conclude on methodology, the significant and negative coefficient of the SE variable in model (2) reveals the existence of a publication bias (Table 4). It seems that published studies tend to report more often a negative effect of negative rating decisions on stock markets. Moreover, the positive and significant coefficient of the SE on model (5) in Table 4 suggests that the variation of reported estimates is influenced by publication bias in favor of research that supports the existence of a positive effect of positive rating decisions on the stock market. In any case, models (2) and (5) provide an estimation of the relationship between CRAs and stock markets after controlling for this publication bias.

5. Conclusion

The first result of our research is that the variation in reported estimates of primary studies is influenced by publication bias in favor of research that respectively supports a negative (positive) effect on the stock market, in case of a negative (positive) rating event. Hence, it seems that authors of primary studies, or academic journals, tend to retain results that point toward negative abnormal returns when there is a negative rating announcement and, conversely in case of a positive one.

The MRA thus allows the ongoing empirical debate on the impact of CRAs' decisions to be settled. Indeed, the main findings of our meta-analysis of 62 studies conducted over the past thirty years indicate that negative rating decisions are associated with significant negative abnormal returns (about -1.71% on average), especially in the USA. Although we confirm that a large part of the reaction occurs prior to the announcement, we identify that it continues once the rating event is known by the investors. In contrast, our analysis indicates that positive rating decisions do not have any significant effect on the stock market (about +0.08% on average), whatever the geographical area.

In addition, after controlling for publication bias, the MRA results also reveal the importance of several factors related to primary study design, as well as to the nature of data. In particular, a focus on emerging countries and other developed countries allows us to conclude that negative rating decisions generate a weaker response on the stock market compared to the US marketplace. The MRA is also useful to clarify the effect of watchlisting compared to rating changes: the magnitude of the stock market reaction is relatively greater in case of a positive watchlist, but weaker in case of a negative one. All being equal, we also highlight that the market response to CRAs' decisions remains higher than it was prior to the 2000s. There is in addition little evidence to suggest that CRAs' decisions have a weaker impact on the non-financial sector. Finally, we also point out the effect of different methodological choices made in the primary studies, such as sample size, nature of statistical tests, and data decontamination procedure.

To conclude, regarding the financial theory, our results help to clarify the information provided by CRAs. We conclude that idiosyncratic information is still conveyed to the stock market by CRAs. More precisely, we confirm the hypothesis of the certification role played by the agencies in case of negative rating events. We also highlight that, in this situation, the signal associated with rating decisions is more important on the US market than it is anywhere else, especially emerging markets. This confirms that CRAs may help to achieve greater market efficiency and reduce information asymmetry, in line with the American model, but that they tend to fail to do so in other marketplaces, as there is no noticeable impact on average.

A worthwhile direction for further research would be to use a meta-analysis approach to explore the impact of rating agencies' decisions on other financial markets, such as bond or CDS markets. Such research would contribute to the debate on the role and credibility of credit rating agencies.

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APPENDIX

TABLE A1
Studies on Positive Events Included in Meta-Analysis (n = 53; k = 857)

Study	Countries analyzed	Period	No of estimates	No. of estimates by event window		
				Before the event	Around the event	After the event
Pinches and Singleton (1978)	USA	1950-1972	2	1	1	0
Holthausen and Leftwich (1986)	USA	1977-1982	16	8	0	8
Glascock *et al.* (1987)	USA	1977-1981	15	6	0	9
Cornell *et al.* (1989)	USA	1982-1985	1	0	1	0
Elayan *et al.* (1990)	USA	1981-1985	9	6	0	3
Cowan (1991)	USA	1981-1990	6	4	2	0
Hand *et al.* (1992)	USA	1977-1982	6	0	0	6
Hsueh and Liu (1992)	USA	1982-1987	36	18	0	18
Schweitzer *et al.* (1992)	USA	1977-1987	6	0	2	4
Singh and Power (1992)	USA	1980-1988	7	3	0	4
Chandy *et al.* (1993)	USA	1982-1987	30	14	0	16
Goh and Ederington (1993)	USA	1984-1986	15	6	0	9
Felton *et al.* (1995)	USA	1985-1987	16	5	1	10
Elayan *et al.* (1996)	USA	1981-1990	12	8	0	4
Akhigbe and Madura (1997)	USA	1980-1993	1	1	0	0
Barron *et al.* (1997)	UK	1984-1992	7	0	0	7
Best (1997)	USA	1984-1992	1	1	0	0
Ederington and Goh (1998)	USA	1984-1990	3	0	1	2
Goh and Ederington (1999)	USA	1984-1990	4	2	0	2
Parisi and Perez (2000)	Chile	1994-1997	21	3	9	9
Dichev and Piotroski (2001)	USA	1970-1997	10	0	10	0
Goyeau *et al.* (2001)	Europe	1988-2000	2	2	0	0
Gropp and Richards (2001)	Europe	1989-2000	10	0	5	5
Elayan *et al.* (2003)	New Zealand	1990-2000	6	6	0	0

(Continued)

Table A1 (Continued)

François-Heude and Paget-Blanc (2004)	France	2001-2003	10	3	2	5
Li *et al.* (2004)	Sweden	1992-2003	4	1	1	2
Jorion *et al.* (2005)	USA	1998-2000	8	0	8	0
Abad-Romero and Robles-Fernandez (2006)	Spain	1990-2003	42	4	25	13
Beaver *et al.* (2006)	USA	1996-2002	8	6	2	0
Choy *et al.* (2006)	Australia	1989-2003	36	12	12	12
Li *et al.* (2006)	Japan	1985-2003	14	0	0	14
Abad-Romero and Robles-Fernandez (2007)	Spain	1990-2003	128	32	48	48
Creighton *et al.* (2007)	Australia	1990-2003	3	1	0	2
Jorion and Zhang (2007)	USA	1996-2002	11	0	11	0
Purda (2007)	USA	1991-2002	24	8	8	8
Behr and Güttler (2008)	Asia, Europe, Africa	1996-2005	1	0	1	0
Verona and Mayor (2008)	Spain	1987-1999	7	3	0	4
Han *et al.* (2009)	Emerging countries	1990-2006	75	0	75	0
Iankova *et al.* (2009)	Europe	1990-2004	60	20	20	20
Taib *et al.* (2009)	UK	1996-2006	24	16	0	8
Halek and Eckles (2010)	USA	1992-2005	39	12	9	18
Bannier and Hirsch (2010)	USA	1991-2004	2	0	2	0
Jorion and Zhang (2010)	USA	1996-2002	3	0	0	3
May (2010)	USA	2002-2009	24	12	0	12
Lal and Mitra (2011)	India	2002-2008	9	3	0	6
Chung *et al.* (2012)	USA	1992-2010	2	0	2	0
Dardour (2013)	Europe	2005-2006	32	12	4	16
Freitas and Minardi (2013)	Latin America	2000-2009	11	0	11	0
Imbierowicz and Wahrenburg (2013)	America, Asia, Europe	2001-2007	10	6	2	2
Sehgal and Mathur (2013)	India	2003 - 2011	2	1	0	1
Tidwell *et al.* (2013)	USA	2000-2009	16	4	4	8
Cohen (2014)	Israel	2012-2013	6	3	0	3
Leventis *et al.* (2014)	Greece	2001-2008	4	1	1	2

TABLE A2
Studies on Negative Events Included in Meta-Analysis (n = 62; k = 1252)

Study	Countries analyzed	Period	No of estimates	No. of estimates by event window		
				Before the event	Around the event	After the event
Pinches and Singleton (1978)	USA	1950-1972	3	1	2	0
Holthausen and Leftwich (1986)	USA	1977-1982	24	12	0	12
Glascock *et al.* (1987)	USA	1977-1981	15	6	0	9
Cornell *et al.* (1989)	USA	1982-1985	1	0	1	0
Elayan *et al.* (1990)	USA	1981-1985	9	6	0	3
Cowan (1991)	USA	1981-1990	6	4	2	0
Hand *et al.* (1992)	USA	1977-1982	12	0	0	12
Hsueh and Liu (1992)	USA	1982-1987	36	18	0	18
Schweitzer *et al.* (1992)	USA	1977-1987	24	0	8	16
Singh and Power (1992)	USA	1980-1988	7	3	0	4
Bi and Levy (1993)	USA	1977-1988	22	10	2	10
Chandy *et al.* (1993)	USA	1982-1987	30	14	0	16
Goh and Ederington (1993)	USA	1984-1986	25	10	0	15
Kumar and Tsetsekos (1993)	USA	1979-1986	8	0	8	0
Felton *et al.* (1995)	USA	1985-1987	16	5	1	10
Elayan *et al.* (1996)	USA	1981-1990	21	14	0	7
Akhigbe and Madura (1997)	USA	1980-1993	1	1	0	0
Barron *et al.* (1997)	UK	1984-1992	7	0	0	7
Best (1997)	USA	1984-1992	1	1	0	0
Followill and Martell (1997)	USA	1985-1988	22	9	2	11
Ederington and Goh (1998)	USA	1984-1990	3	0	1	2
Goh and Ederington (1999)	US	1984-1990	22	11	0	11
Parisi and Perez (2000)	Chile	1994-1997	22	3	9	10

(Continued)

TABLE A2 (Continued)

Dichev and Piotroski (2001)	USA	1970-1997	10	0	10	0
Goyeau *et al.* (2001)	Europe	1988-2000	2	2	0	0
Gropp and Richards (2001)	Europe	1989-2000	10	0	5	5
Schweitzer *et al.* (2001)	USA	1977-1998	2	0	0	2
Caton and Goh (2003)	USA	1984-1990	4	4	0	0
Elayan *et al.* (2003)	New Zealand	1990-2000	6	6	0	0
François-Heude and Paget-Blanc (2004)	France	2001-2003	10	3	2	5
Li *et al.* (2004)	Sweden	1992-2003	2	1	1	0
Norden and Weber (2004)	Asia, Europe, USA	2000-2002	42	18	6	18
Jorion *et al.* (2005)	USA	1998-2002	8	0	8	0
Abad-Romero and Robles-Fernandez (2006)	Spain	1990-2003	64	8	38	18
Beaver *et al.* (2006)	USA	1996-2002	8	6	2	0
Choy *et al.* (2006)	Australia	1989-2003	36	12	12	12
Li *et al.* (2006)	Japon	1985-2003	14	0	0	14
Abad-Romero and Robles fernandez (2007)	Spain	1990-2003	192	48	72	72
Creighton *et al*. (2007)	Australia	1990-2003	21	7	0	14
Jorion and Zhang (2007)	USA	1996-2002	11	0	11	0
Purda (2007)	USA	1991-2002	24	8	8	8
Behr and Güttler (2008)	Asia, Europe, Africa	1996-2005	1	0	1	0
Poon and Chan (2008)	China	2002-2006	7	1	3	3
Verona and Deniz-Mayor (2008)	Spain	1987-1999	7	3	0	4
Han *et al.* (2009)	Emerging countries	1990-2006	75	0	75	0
Iankova *et al.* (2009)	Europe	1990-2004	60	20	20	20
Taib *et al.* (2009)	UK	1996-2006	24	16	0	8
Halek and Eckles (2010)	USA	1992-2005	39	12	9	18
Bannier and Hirsch (2010)	USA	1982-1991	2	0	2	0
Jorion and Zhang (2010)	USA	1996-2002	20	0	10	10
May (2010)	USA	2002-2009	24	12	0	12

(Continued)

TABLE A2 (Continued)

Lal and Mitra (2011)	India	2002-2008	15	5	0	10
Chung *et al.* (2012)	USA	1992-2010	2	0	2	0
Pacheco (2012)	Portugal	2006-2011	84	48	24	12
Dardour (2013)	Europe	2005-2008	16	6	2	8
Freitas and Minardi (2013)	Latin America	2000-2009	11	0	11	0
Imbierowicz and Wahrenburg (2013)	America, Asia, Europe	2001-2007	10	6	2	2
Sehgal and Mathur (2013)	India	2003-2011	2	1	0	1
Tidwell *et al.* (2013)	USA	2000-2009	16	4	4	8
Cohen (2014)	Israel	2012-2013	6	3	0	3
Leventis *et al.* (2014)	Greece	2001-2008	4	1	1	2
Alsakka *et al.* (2015)	Europe	2008-2013	24	6	0	18

TABLE A3
Descriptive Statistics of Estimated Effects of Rating Agencies' Decisions on the Stock Market, by Event Window

	Before Negative events		Before Positive events	
	Number	%	Number	%
Number of studies	44		37	
Number of estimates	395	100	254	100
Negative and statistically significant	191	48	9	4
Negative and positive insignificant	189	48	192	76
Positive and statistically significant	15	4	53	20
CAAR				
Unweighted average	-3.053% (-3.475 to -2.632)		+1.636% (+1.072 to +2.200)	
Weighted average	-1.110% (-1.310 to -0.822)		+0.029% (-0.018 to +0.077)	

	Around Negative events		Around Positive Events	
	Number	%	Number	%
Number of studies	36		29	
Number of estimates	377	100	280	100
Negative and statistically significant	171	45	36	13
Negative and positive insignificant	200	53	209	75
Positive and statistically significant	6	2	35	12
CAAR				
Unweighted average	-2.247% (-2.753 to -1.740)		-0.173% (-0.611 to +0.267)	
Weighted average	-0.346% (-0.443 to -0.249)		+0.004% (-0.037 to +0.045)	

	After Negative Events		After Positive events	
	Number	%	Number	%
Number of studies	43		37	
Number of estimates	480	100	323	100
Negative and statistically significant	147	31	36	11
Negative and positive insignificant	299	62	254	79
Positive and statistically significant	34	7	33	10
CAAR				
Unweighted average	-0.590% (-0.764 to -0.416)		-0.093% (-0.330 to +0.144)	
Weighted average	-0.192% (-0.196 to -0.189)		-0.022% (-0.062 to +0.019)	

Notes: The unweighted average is the simple average of observations. The weighted average is calculated by using the inverse of variance as weights.

FIGURE A1 Funnel Plots of Estimates of Rating Agencies' Decisions on the Stock Market, by Event Window