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Credit Rating Industry: a Helicopter Tour of Stylized Facts and Recent Theories

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Abstract

The recent subprime crisis and the ongoing Euro zone crisis have generated an enormous interest in the credit rating industry not only among economists but also among average citizens. As a consequence, we have seen an explosion of the economic literature on the industry. The objective of this survey is to introduce readers to the key stylized facts of the credit rating industry and to the recent theoretical economic literature on this industry.

Key words: Credit Rating Agencies, Reputation, Financial Regulations, Conflicts of Interest, Certification

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1. Introduction

The recent subprime crisis and the ongoing Euro zone crisis have generated an enormous interest in the credit rating industry not only among economists but also among average citizens. As a consequence, we have seen an explosion of the economic literature on the industry. The objective of this survey is to introduce readers to the key stylized facts of the credit rating industry and to the recent theoretical economic literature on this industry. This survey can be of interest to researchers working on industrial organization since quality certification is a major issue in industrial organization and credit rating agencies (CRAs) provide information about quality of financial obligations such as bonds.

After providing basic stylized facts (Section 2), we review the recent theoretical literature (Section 3) and propose some directions for future research (Section 4).

2. Stylized facts

2.1. Historical and regulatory background

John Moody was credited with initiating the first bond-rating agency, in the United States in 1909, which was entirely focused on railroad bonds. According to Sylla (2002), a historian of finance, Moody's bond-rating agency represents a fusion of functions performed by the following three institutions that preceded it, namely credit-reporting agencies, specialized financial press, and investment bankers.

First, starting from the middle of the nineteenth century, credit-reporting agencies sold subscribers information on business standing and creditworthiness of all sorts of businesses in U.S. Some of these agencies used to sell *commercial rating books*.

Second, there were specialized publications reporting on the railroad corporations, which were America's first big businesses in the sense of multi-divisional enterprises operating over large geographical expanses. They published information on the property of railroads, their assets, liabilities and earnings. Poor's Manual of the Railroads of the United States, which started in 1868, was one such publication. Third, investment bankers acted as financial intermediaries between investors and railroad corporations issuing bonds by making use of inside information.

At the turn of the twentieth century, as the size of U.S. investing class expanded, there were increasing demands from investors for wider disclosure of the information on the railroad corporations. Moody met such demands by publishing Moody's Analysis of Railroad Investments. This volume collected data, analyzed railroad securities and then condensed the analysis into a single rating symbol. Simplicity sold and Moody's rating system became an instant hit with investors. Success attracted competition. Moody's was followed by Poor's Publishing Company in 1916, the Standard Statistics Company in 1922, and the Fitch Publishing Company in 1924. Poor's and Standard merged in 1941.

Financial regulators played a crucial role in enhancing the role and power of CRAs.[1] The first regulator to take notice of credit rating was the Federal Reserve System. Beginning in 1930, it implemented a system based on the credit ratings for evaluating the risk of a bank's entire portfolio of bonds. In 1936, the Comptroller of the Currency required that bonds purchased by national banks be rated as of

[1] Our description of the regulatory background is based on Coffee (2006).

investment grade 'by not less than two ratings manuals'— in modern ratings, this would be equivalent to bonds that were rated BBB– or better on the Standard & Poor's scale.[2]

The next major use of credit ratings by regulators came in 1975 by the Securities and Exchange Commission (SEC). The SEC revised Rule 15c3-I, its 'net capital' rule for broker dealers, requiring mandatory write-downs (or 'haircuts') on the broker's balance sheet for securities which were deemed risky. Instead of elaborately defining the criteria for various levels of risk, the SEC chose to rely on the credit ratings such that the higher the credit rating, the less the write-down. However, to guarantee reliability of ratings, the SEC introduced the category of 'Nationally Recognized Statistical Ratings Organizations' (NRSROs). Only the ratings issued by the CRAs with the NRSRO accreditation are relevant for its regulation. With the introduction of NRSROs, the SEC grandfathered Moody's, Standard & Poor's, Fitch into the category and excluded start-ups and fly-by-night small CRAs.

Once the concept of NRSRO became established, it was quickly adopted for a variety of other regulatory purposes. For instance, in the early 1980s, the SEC limited money market funds to investments in securities that were given a high rating by at least two NRSROs. The insurance industry has also piggybacked on the NRSRO concept: the National Association of Insurance Companies has relied heavily on NRSRO credit ratings and effectively has penalized insurance companies that invest in low-rated or unrated debt.

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[2] Ratings bellow BBB- are called non-investment or speculative grades.

Whatever the category of institutional investors – federal or state bank, mutual fund, broker-dealer or insurance company – their capital structure is regulated to assure financial solvency. Across a broad range of contexts, state and federal regulators found it simpler to delegate the task of risk assessment to the NRSRO credit-rating agencies. Moreover, on the global level, international bank regulators followed this same path through the Basel Accords. For instance, the "standardized approach" developed by Basel II framework uses credit ratings to determine risk-weights for capital requirement.[3]

The important role that regulation plays for the credit rating industry helps to understand two opposing views of CRAs. The traditional view is to regard CRAs as 'reputation intermediaries' that reduce the information asymmetry between issuers and investors: an issuer uses the reputation of CRAs to send a credible signal that its securities are of above average quality in order to pay a below average interest rate. [4]

Although this reputation intermediary view has been dominant, it is contested by an alternative 'regulatory license' view (Partnoy, 1999). According to this view, ratings are valuable, not because they are accurate and credible, but because they are the key for reducing costs associated with regulation. Rating agencies sell regulatory licenses to issuers. Because investors' regulatory costs are lower when holding bonds

[3] See the report from the Joint Forum (2009) for an overview of the use of credit ratings in financial regulations among different countries in the world.

[4] As is illustrated in Section 3, this mechanism works only if the certifying agencies have reputational capital which exceeds the gain from false certification.

with investment grade ratings, issuers' proceeds from selling such bonds are larger than selling bonds with no rating or speculative grade ratings. The value of a regulatory license hence needs not be based on reputational capital as long a CRA has its NRSRO status. This alternative view predicts a 'race to the bottom' among CRAs: competition among CRAs for selling a rather homogenous product of regulatory licenses will induce CRAs to be lax in attributing high rating to attract issuers. As a result, more competition should lead to a decrease in information content of ratings.[5]

Becker and Milbourn (2011) find some evidence of 'race to the bottom' in that the increased competition from Fitch led Moody's and S&P's to decrease information content of ratings by providing higher ratings than before Fitch became a serious competitor. Furthermore, what took place during the recent financial crisis (see Section 2.3) has given credit to the regulatory license view since the major CRAs still remain very powerful even after losing their reputational capital. However, there is some evidence contradicting 'race to the bottom' as well. For instance, Doherty *et al*. (2011) find that in the case of Standard & Poor's entry into the market for insurance ratings previously covered by a monopolist, A. M. Best, the entrant employed more stringent rating standards than the incumbent. Overall, we think that both views have some elements of truth.

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[5] For instance, monopoly pricing leads to a higher price than duopoly pricing, implying that competition makes it cheaper for an issuer to buy a high rating. If an issuer's willingness to pay for a high rating is positively correlated with the quality of the project the issuer wants to finance by issuing bonds, we should observe that more competition results in a reduction in information content of high rating.

2.2. Fee and market structure

As we have seen, originally, CRAs' revenues came from investor's subscriptions, which is called the 'investor-pays' model. However, in the early 1970s, CRAs switched from the 'investor-pays' model to the 'issuer-pays' model. This happened partly because of the invention of high-speed photocopy machines that made it easier for non-subscribing investors to free-ride on the information in rating books.

In the 'issuer-pays' model, an issuer pays an upfront fee for an assessment of its default risk. In case the issuer asks the CRA to publicize the rating, it will pay an additional fee. More precisely, according to Coffee (2008, pp. 71-72) in a congressional testimony:

"Today, the rating agencies receives one fee to consult with a client, explain its model, and indicate the likely outcome of the rating process; then, it receives a second fee to actually deliver the rating (if the client wishes to go forward once it has learned the likely outcome). The result is that the client can decide not to seek the rating if it learns that it would be less favorable than it desires; the result is a loss of transparency to the market."

A typical fee on a new long-term corporate bond issue ranges between 4 and 5 basis points of the principal amount. Thus the rating fee for a US$200 million 10-year bond issue would be somewhere in the range of US$80,000 to $100,000 (Langohr and Langohr, 2009, p. 413).

The current fee structure has been criticized for mainly two reasons. First, because it is the issuer who ultimately decides whether a given rating becomes public or not,

the issuer can shop for rating. That is, an issuer can ask ratings from multiple CRAs and then publicize only the most favorable ratings. Second, because CRAs are paid by issuers, they might be tempted to please them with favorable ratings and charge the additional fee resulting from publicizing their ratings. Whether CRAs' reputational concerns are strong enough to make these conflicts not relevant is among the central questions many recent papers have tried to answer theoretically and empirically (see Section 3.3).

In terms of the market structure, the credit rating industry is a triopoly (Moody's, Standard & Poor's, Fitch) with the joint dominance of the first two. The SEC designated only four additional firms as NRSROs during the 25 years following the creation of NRSRO category in 1975: Duff & Phelps in 1982, McCarthy, Crisanti & Maffei in 1983, IBCA in 1991 and Thomson BankWatch in 1992. However, mergers among the entrants and Fitch caused the number of NRSROs to return to the original three by year-end 2000.

The market shares (based on revenues or issues rated) of the three firms are commonly estimated to be approximately 40, 40, and 15 percent for Moody's, Standard & Poor's and Fitch, respectively (White, 2010, p.216-217). Aggregated credit rating revenues of Fitch, Moody's, and S&P grew at a compounded annual growth rate of 17% during 1998–2005, reaching $4.9 billion (Langohr and Langohr, 2009, p. 419).

Most of the available public information is about Moody's, the only free-standing company. Since September 20, 2000, Moody's has been listed on the NYSE. By the end of 2005, it reached a stock market capitalization of around $18 billion, more than

quadrupling its $4 billion IPO values (Langohr and Langohr, 2009, p. 419). According to the annual report of 2007, the peak year just before the onset of the financial crisis, the company's total revenues were $2.259 billion, its net income $701 million, and its total assets $1.714 billion. Total ratings revenue was $1.779 billion, meaning that seventy-eight percent of the company's revenues came from ratings in 2007.

Between 2003 and 2008, the SEC designated seven new NRSROs (five among them during 2007 and 2008) such that the total number of NRSROs reached ten by 2010. However, up to now, the SEC's belated efforts to allow wider entry have had little substantial effect: the inherent advantages of the "Big Three's" incumbency could not quickly be overcome by the subsequent NRSRO entrants (White, 2010, p.222).

2.3. Financial crisis, credit ratings and the reform of the Dodd-Frank Act

The major rating agencies are often criticized for the sluggishness in adjusting their ratings. For instance, until a few days before Enron's bankruptcy in November 2001, all three major agencies rated it in the investment category: Standard & Poor's and Fitch gave it a BBB rating and Moody's gave a notch below Baa 3 rating. The major rating agencies still had investment grade ratings on Lehman Brothers even in the morning that Lehman declared bankruptcy in September 2008.

Additionally, the major CRAs are criticized for being a central culprit to the recent financial crisis because of their handling of structured finance securities. Structured finance securities are made by pooling and/or tranching of various financial assets. For instance, collateralized debt obligations (CDOs) consist of debts

originating from different issuers that are pooled and tranched. In the event of default, losses are absorbed first by junior tranches and then by mezzanine tranches before senior tranches are affected. A large fraction of CDOs issued over the course of the last decade were CDO-squared (i.e. CDOs made by pooling and tranching CDOs) of subprime residential mortgages. By December 2008, structured finance securities accounted for over $11 trillion worth of outstanding U.S. bond market debt (Benmelech and Dlugosz, 2010).

The success that structured finance securities had with investors is in part due to the fact that these assets had been engineered to have AAA-ratings. In particular, pooling and tranching allows to transform junk bonds into AAA-rated securities.[6] Roughly 60 percent of all global structured products were AAA-rated. As a comparison, less than 1 percent of the corporate issues are AAA-rated (Fitch, 2007, p.5).

However, estimation of default probability of tranches is very sensitive to the assumptions made about default correlation and exposure to macroeconomic shocks. The CRAs made extremely optimistic assumptions. For instance, in 2007, Fitch's rating model was based on the assumption of constantly appreciating home prices. Their model would break down with 2 percent decline in house prices (Coval, Jurek and Stafford, 2009, p.21-22). This is what happened in during the sub-prime crisis: the creditworthiness of structured finance securities deteriorated dramatically and 36,346 tranches rated by Moody's were downgraded (Benmelech and Dlugosz, 2010).

[6] Coval, Jurek and Stafford (2009) explain well this process.

To some extent, the recent financial crisis is a regulatory failure: financial regulations relying on ratings created a lucrative market for rating arbitrages to which investment banks responded by manufacturing AAA-rated structured financial securities with active assistance from the major CRAs.

The major CRAs have also been criticized for worsening the recent crises (the East Asian crisis, the subprime crisis and the Euro zone crisis) by acting in a pro-cyclical way.[7] Historically, CRAs were thought to maintain a system characterized by stable ratings, with a time horizon that extended to several years and a declared intention to 'rate through the cycle.'

"The ideal is to rate "through the cycle." There is no point in assigning high ratings to a company enjoying peak prosperity if that performance level is expected to be only temporary. Similarly, there is no need to lower ratings to reflect poor performance as long as one can reliably anticipate that better times are just around the corner." (Standard & Poor's, 2007).

However, the behavior of the major CRAs seems to be inconsistent with rating-through the cycle. For instance, during the Euro zone crisis, the agencies were initially slow to downgrade Greek debt, especially Moody's which waited until December 2009 before taking its first decision. This waiting period was followed by a period of severe downgrades: after leaving the Greek rating unchanged from 2003 to 2009, Moody's downgraded it by nine notches in the fifteen months that followed (Sénat, 2012, p. 102). In particular, a downgrade from an investment grade to a

[7] See Ferri, Liu and Stiglitz (1999) for instance regarding the role of CRAs in the East Asian Crisis.

speculative grade can be self-fulfilling. More precisely, given that regulations constrain many institutional investors to hold only bonds of investment grades, such downgrade can cause massive sales and make borrowing very difficult for the issuer. This is called the 'cliff effect' (Sénat, 2012, p. 90).

We close this section by reviewing the reforms of the credit rating industry recently introduced by The Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 (see the Sections 931-939H). Two main building blocks of the reforms are 'removal of statutory references to credit ratings' and 'study and recommendation of a new system to assign NRSROs to determine the credit ratings of structured finance products'.[8]

First, Section 939 removes statutory references to credit ratings in several acts such as Federal Deposit Insurance Act, Securities Exchange Act etc. Section 939A requires each federal regulatory agency "to remove any reference to or requirement of reliance on credit ratings and to substitute in such regulations such standard of credit-

[8] In addition, the Dodd-Frank Act requires the SEC to adopt a number of new rules concerning: annual reports on internal controls, conflicts of interest with respect to sales and marketing practices, "look-backs" when credit analysts leave the NRSRO, disclosure of performance statistics, application and disclosure of credit rating methodologies, form disclosure of data and assumptions underlying credit ratings, disclosure about third part due diligence, analyst training and testing, consistent application of rating symbols and definitions etc.

worthiness as each respective agency shall determine as appropriate for such regulations". [9]

The removal of statutory references would reduce issuers' demand for ratings, which in turn would induce investors to rely more on other providers of financial information. However, credit ratings are used in investment guidelines and private contracts such as collateral agreements. Hence, issuers' incentives to obtain credit ratings at certain levels will not disappear along with statutory uses of credit ratings.

Second, the Section 939F asks the SEC to carry out a study of (1) the credit rating process for structured finance products and the conflicts of interest associated with the issuer-pay and the subscriber-pay models and (2) the feasibility of establishing a system in which a public or private utility or a self-regulatory organization assigns NRSROs to determine the credit ratings of structured finance products. This feasibility study shall include an assessment of potential mechanisms for determining fees for the NRSROs.

Also, Section 939F requires the SEC to establish by rule a system to assign NRSROs to determine the initial credit ratings of structured finance products and, when issuing any rule, to give thorough consideration to the provisions of Section 15E(w) of the Securities Exchange Act of 1934, which should be implemented unless the SEC find a better alternative. Under the system of the Section 15E(w), the SEC should establish a CRA Board to which an issuer is required to submit a request for

[9] Accordingly, the federal agencies proposed alternatives to credit ratings for calculating risk-weighted assets in capital requirements for banks.

the initial credit rating. The Board selects a Qualified NRSRO to provide the initial rating whereas the issuer-pays model is maintained. Having the Board assign a Qualified NRSRO can mitigate the issuer-pays conflict with respect to initial ratings; however, issuers might continue to engage in rating shopping with respect to supplementary ratings. The system can provide smaller NRSROs with the opportunity to develop a reputation for accurate ratings and also promote competition among CRAs to provide accurate ratings. The recent SEC report (2012) studied the benefits and costs of various models of CRA compensation including the Section 15E(w) system.

3. Survey of the recent theoretical literature on CRAs

3.1. General framework

A comprehensive review of the theoretical literature on the credit rating business should include the theory on certification and experts' incentive starting from the seminal works of Lizzeri (1999) and Holmström (1999). Also, because the financial regulation protecting investors plays a crucial role for CRAs, the bank regulation literature underlying investor-protection (Bryant, 1980, and Diamond and Dybvig, 1983) should enter the picture. However, the purpose of this section is less ambitious. We shall concentrate on the recent papers that, in our opinion, analyze the main tradeoffs and frictions that are particularly pronounced in the CRA business. Figure 1 describes our focused but still broad framework that is common among these papers. Namely, the CRAs play the role of information/ communication intermediaries in a two-sided market composed of issuers and investors. The agencies are paid by issuers

and provide public information about default risks in the form of ratings. The figure also emphasizes the role played by rating-based financial regulations on the investor side.

There are three basic features that are common to most models of the recent theories on CRAs. First, there are cash-constrained firms who issue bonds to finance risky projects. Second, investors' demand for a bond depends on their perception of the bond's default risk and/or on some regulatory constraints. Third, CRAs publicize ratings that can affect investors' demand and hence the equilibrium price a given issuer can charge for the bond. Issuers and/or investors are willing to pay for CRAs' services as long as ratings affect investors' demand.

3.2. The three channels linking CRAs' ratings to bond prices

A CRA can affect investors' demand through three channels: regulation, coordination and information. We below describe the functioning and effects of each channel.

Regulation channel: Because of regulation, some institutional investors value less or simply cannot purchase bonds whose rating is below investment grade. As a result, bonds that receive a rating below investment grade will be issued at a price lower than the price for bonds with investment grade ratings. This occurs independently of the bonds' actual default risk and even if CRAs have no superior information about issuers' default risk. The effect from the regulation channel is stronger when passing

the threshold of investment grade: a change in rating impacts the cost of capital mostly when passing from investment grade to speculative grade and vice versa.[10]

Coordination channel: An issuer can endogenously affect the default risk either because she or he can choose among projects with different risk (Boot *et al*. 2006) or because the decision to default is endogenous (Manso, 2011, and Elendner, 2012). In both cases the issuer's optimal choice is likely to depend on the cost of capital, i.e., the interest rate the issuer has to pay on its debt. This can give rise to multiple equilibria where a higher cost of capital leads the issuer to choose high default risk whereas a lower cost of capital endogenously reduces the issuer's default risk. The role of a CRA's rating then is to provide issuers and investors with a coordination device. In other words, even when CRAs have no power from financial regulation and no superior information about default risk, ratings can be self-fulfilling because they affect the coordination between issuers' choice of default risk and investors' demand for bonds.

Information channel: Issuers' projects to be financed can have different qualities, i.e., different default risks. Unlike the coordination channel, a project's default can be considered exogenous and is unknown to investors. A CRA has a screening technology generating a private signal that is correlated with the project's actual

[10] Kisgen and Strahan (2010) provide evidence that the regulation channel actually matters. They empirically analyzed how the impact of Dominion Bond Rating Service's rating on bonds prices changed after the SEC certified DBRS as the fourth NRSRO in 2003. They found that the change in DBRS's status affected yields on the bonds it rated. They also found that the effect on yields is stronger around the investment grade boundary, where regulations based on ratings are most prevalent and significant.

quality.[11] As long as a CRA publicizes a rating that is correlated with its private signal, the rating will affect investors' belief about the project quality and hence the equilibrium price the issuer can charge for its bonds. Namely the selling price of the bonds does not decrease in the project's expected quality and does not increase in the variance of the project's quality. Note that what we call the information channel refers to the additional information that ratings give about an exogenously fixed default risk.

Clearly, there are complementarities and tradeoffs across the three channels. In particular when a firm's decision to make default is endogenous, both the regulation channel and the information channel reinforce the coordination channel. When ratings affect cost of capital through their information content or the implied regulatory constraints, it will also affect the financial decision to default. On the other hand, the regulation channel can weaken the information channel. Because regulation ensures that even a non-informative rating can affect prices and has a value to issuers, CRAs' have less incentives to collect superior information.

Many of the theoretical papers we consider in this survey focus on the information channel. Some papers combine the information channel with the regulation channel (Bolton *et al.*, 2009 and Opp *et al.*, 2011) and/or the coordination channel (Manso, 2011 and Elendner, 2012). We are aware of only one paper focusing on the coordination channel (Boot *et al.*, 2006) and of no theoretical paper that exclusively studies the regulation channel.

[11] Here the implicit assumption is that investors have no alternative source of information.

3.3. The added value of a credit rating system

The central question in the theoretical literature is whether the introduction of CRAs improves information and efficiency in terms of allocation of investors' funds relative to the situation where CRAs are absent. The answer to this question depends on the specific channel linking rating and bond prices.

If ratings affect investors' demand purely because of the regulation channel, the presence of CRAs cannot improve information efficiency because CRAs, by assumption, have no superior information on issuers' default risk. The use of CRAs can improve allocative efficiency only in the presence of conflicts of interest between institutional investors and their clients, a dimension that is not explicitly analyzed in any of the models we have considered in this survey. When such conflicts exist, the use of ratings for regulatory purpose, even if the ratings just reflect public information, prevents institutional investors from taking excessive risk when they invest funds coming from insured deposits. However, absent the conflicts of interest between funds providers and institutional investors, CRAs cannot improve allocative efficiency**.** First, because a rating has no information content but, through the regulatory constraint, can affect allocation, at best it will lead to the same allocation that emerges without regulation. Second, because a CRA will be able to charge fees for delivering 'regulatory licenses', it will divert issuers' resources from its core business activity.

When ratings affect investors' demand through the coordination channel, desirability of a CRA system relies on its ability to coordinate investors and issuers

toward the most efficient equilibrium. Obviously, nothing can be gained from the presence of CRAs if, in their absence, issuers and investors would already coordinate on the most efficient equilibrium. In contrast, if the economy tends to coordinate on less efficient equilibria, the introduction of CRAs can improve efficiency. This is because a CRA, who cares enough about its long-term relation with issuers, is likely to select equilibria that minimize issuers' default probabilities. These are indeed the most efficient equilibria (Boot *et al*., 2006, Manso, 2011, Elendner, 2012).

When bond prices react to ratings through the information channel, the desirability of CRAs depends on reliability of ratings. Reliability of a CRA's rating depends on three factors. First, the CRA's information acquisition technology, that is the CRA's ability to gather reliable private information and properly assess a project's actual default risk. Second, the CRA's rating policy that determines the mapping of its private information into its rating. Third, the issuer's rating disclosure right, which is the issuer's ability to prevent low ratings from being communicated to investors. Maximum informational efficiency is attained when the CRA's information technology is accurate and the rating policy is truthful (i.e. it fully reflects the CRA's private information). Note however that an increase in informational efficiency does not necessarily lead to a higher social welfare (Kurlat and Veldkamp, 2012). Also, thanks to the coordination channel, inaccurate ratings might be beneficial to reduce average default risk. For example when low risk issuers are pooled with more risky issuers, the latter benefit from a lower cost of capital and hence it improves their default risk.

There are different factors that can drive the equilibrium away from the maximum informational efficiency benchmark. Primarily the information content of a CRA's ratings depends on its incentives to invest in gathering private information and to publicize this information through their ratings. These incentives vary depending on the CRA's ability to commit ex ante (i.e. before observing the realization of its private signal) to a given rating policy. In the next sub-sections, we review two approaches. The first builds on the assumption that CRAs can commit to any given rating policy before observing the realization of their private information. The second considers the case where CRAs cannot commit ex-ante to a rating policy but will issue the rating maximizing their continuation payoffs. Because CRAs often provide their clients with some relevant but partial information about the criteria used to translate the CRAs' information into ratings, the two approaches are complementary for the understanding of the real functioning of the business.

3.3.1. CRAs with contractible rating policies

Let us consider first the case where the CRA can commit ex ante to a specific rating policy (Bongaerts, 2012, Doherty *et al*., 2011, Opp *et al*., 2011, and Skreta and Veldkamp, 2009). In principle, the CRA can then commit to any level of reliability of rating, within the limits imposed by its information acquisition technology. Among these levels a CRA will choose the one that maximizes its profit. Within a static framework, this boils down to choosing the rating accuracy that maximizes the rating fees net of the cost of extracting the private information.

The effect of informed issuer: When issuers are privately informed about their own default risk (Bongaerts, 2012, Doherty *et al*., 2011, Opp *et al*., 2011, and Skreta and Veldkamp, 2009), it is not optimal for the CRA to commit to very accurate ratings. A CRA providing accurate rating will only be hired by issuers whose default risk is relatively low. However, by committing to add some noise in its rating, the CRA will be able to attract a larger number of issuers.[12] Namely, it can attract the issuer whose default risk is above average but who will be pooled in the same rating category with some below-average-risk issuers. Reducing rating accuracy, however, will decrease the effect of rating on investors' demand and hence decrease the fee a CRA can charge to each issuer. Thus, the level of rating accuracy that maximizes a CRA's profit is neither perfect accuracy nor nil accuracy. In the presence of a continuum of possible levels of default risk it is optimal for a monopolist CRA to pool different risk levels into discrete rating categories.[13]

The effect of naïve investors: We will define an investor to be naïve if he or she is willing to pay a premium for a highly rated bond, independently of the actual accuracy of ratings.[14] The most sensible justification for the presence of naïve

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[12] For instance, Lizzeri (1999) considers a monopoly certification intermediary with perfect screening technology that can commit to a disclosure policy and a single fee. In the unique equilibrium, all sellers pay a positive fee for a single completely uninformative rating.

[13] For instance, Doherty *et al*, (2011) extend Lizzeri (2009) to the CRA business by introducing a parameter representing the value of precision to investors and show the optimality of interval disclosure policy.

[14] Naïve investors are defined in Bolton *et al.* (2009) within a framework where CRAs have no commitment power.

investors is the regulatory constraints imposed on some institutional investors (see Section 2.1). This type of investors plays a crucial role in Boot *et al*. (2006), Opp *et al*. (2012), and Skerta and Veldkamp (2009). Their presence increases the positive impact of a high rating on the bond's selling price. It adds value of the ratings in the eyes of issuers, as long as they can hope for a high rating. As a result the CRA has weaker incentives to both retrieve accurate signals and publicize negative ratings. Thus the presence of naïve investors has the effect of reducing rating accuracy by generating rating inflation.[15]

The effect of rating shopping: As customary in the business, each CRA first informs the issuer of its 'shadow' rating, and then for each CRA the issuer decides whether the shadow rating will be publicized or not. [16] Because the announced ratings are the highest one(s) among the shadow ratings obtained by the issuer, it will be a biased signal of the issuer's true default risk. The more complex are the projects, the bigger will be the dispersion of shadow ratings and hence the discretion the issuer has in picking the best rating. In Sangiorgi *et al*. (2009) and Skreta and Veldkamp (2009), CRAs are committed to truthful ratings that reflect CRAs' private information. They

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[15] Pagano and Volpin (2009, 2012) consider situations where default risk depends on two factors and assume that a fraction of the investors are unsophisticated and cannot price one of the two factors. They show that the presence of unsophisticated investors induces issuers to prefer a degree of rating accuracy that is below the social optimum.

[16] Faure-Grimaud, Peyrache and Quesada (2009) study renogotiaiton-proof rating contracts signed between a CRA and an issuer and analyze the conditions under which the former finds it optimal to provide the latter with the option to hide rating. They identify competition as a necessary condition.

show that publicized ratings are nevertheless inflated because of rating shopping.[17] Benmelech and Dlugosz (2010) present some evidence of rating shopping in structured finance. Using data on CDOs backed by asset-backed securities (ABS),[18] they find that tranches rated by only one rater were more likely to be downgraded than tranches rated by multiple raters. However, they also find that more than 80% of all tranches were rated by two or three agencies. These empirical findings suggest that rating shopping was present but not pervasive.

3.3.2. CRAs with non-contractible rating policies

In this subsection, we consider the case of a CRA that cannot commit ex-ante to any given rating policy. After cashing-in the rating fees and observing its private information, such a CRA will publicize the rating that maximizes its continuation payoff. Within a static framework, if rating fees are paid before ratings are publicized, the CRA has no particular incentive neither to exert effort to gather its private information, nor to publicize ratings that are correlated with its private information. In contrast, within a dynamic framework, reputation can incentivize a CRA without commitment power to publicize reliable ratings.

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[17] The mechanism generating rating inflation through rating shopping is similar to the one studied in Broeker (1990) for competition among screening agents.

[18] ABS is a general term for bonds or notes backed by pools of assets. Common types of collateral for ABS are auto loan receivables, student loan receivables, and so on. Mortgage-backed securities (MBS) refer to the ABS whose cash flows are backed by the principal and interest payments of a set of mortgage loans.

Broadly speaking, a CRA's reputation at time *t* is the belief (at time *t*) of issuers and investors that the CRA's rating will be accurate. Reputation evolves because the observed correlation between ratings and actual defaults of implemented projects provides evidence about a CRA's ability to publicize reliable ratings. An increase in a CRA's reputation increases the information content of ratings in the eyes of investors and issuers. Thus, ratings from a reputable CRA will affect bond prices more than ratings from a CRA with a weak reputation. As a result, the rating fees a CRA can charge depend on the CRA's reputation. Thus, when a CRA without commitment power chooses today's rating to publicize, it will take into account the effect of the rating on its future reputation and profits.

More formally, reputation is the public's beliefs over the possible types of CRA. In some papers (Bouvard and Levy, 2012, Frenkel, 2011, Fulghieri *et al*., 2010, Mathis *et al*., 2009), CRA types concern the CRA's commitment to a specific rating policy rather than to choose an opportunistic rating. Namely an opportunistic CRA is committed to no specific rating policy and will always publicize the rating that maximizes its continuation payoff. In contrast, a CRA of a committed type does not care about profits and will always rate according to a pre-defined exogenous rating policy: in Fulghieri *et al*. (2010) and Mathis *et al*. (2009), a committed type adopts the truthful rating policy; in Frenkel (2011) or Bouvard and Levy (2012), a committed type chooses high rating systematically or preferentially. In other papers (Jeon and Lovo, 2012, and Mariano, 2012) CRA types concern the accuracy of the CRA's information acquisition technology. An accurate type CRA has reliable private information about issuers' default risk whereas an inaccurate type CRA's private

information is less reliable. Both accurate and inaccurate types are opportunistic in the sense that they chose ratings in order to maximize continuation profits (Jeon and Lovo, 2012) or reputation (Mariano, 2012).

These papers show that reputation concerns can lead to truthful rating policies as long as four conditions are met. First, the fee a CRA can charge for a high rating is not too high compared to the fee that can be charged for a low rating (Fulghieri *et al*., 2010, and Mathis *et al*., 2009). Second, the probability that a CRA's private signal is wrong is not too large (Mariano, 2012). Third, the CRA's urge to build up reputation is not too strong (Jeon and Lovo, 2012). Fourth, the current reputation for truthful rating in the eyes of informed issuers is not too strong (Bouvard and Levy, 2012, and Frenkel, 2011).

The effect of contingent fees: Fulighieri *et al*. (2010) and Mathis *et al*. (2009) consider the case where CRA's rating fees for delivering a high rating are larger than the fees charged for delivering a low rating.[19] A CRA will not adopt the truthful rating policy whenever the short term gain from inflating rating is stronger than the resulting possible loss in reputation from such inflation. When the difference between high-rating and low-rating fees is large enough, the CRA opts for high-rating inflation. More precisely, Mathis *et al*. (2009) present a model of reputation à la Benabou and

[19] In Mathis *et al*. (2009), this results from the fact that a project whose rating is low is not implemented and hence is assumed to generate no rating fee. In Fulghieri *et al*. (2010), this results from the custom of paying for publicized rating (see Section 2.2) and from the fact that an issuer will not pay for having a low rating publicized.

Laroque (1992). The fee a monopolistic CRA can charge for a high rating increases with the CRA's reputation for being committed to truthful rating policy. They show that when rating is a major source of income for a CRA, then as soon as the CRA's reputation for being committed is strong enough, it becomes optimal for an opportunistic CRA to be lax in its rating. In Fulghieri *et al*. (2010), the focus is on the role of solicited and unsolicited ratings. A monopolist CRA first builds up its reputation for being committed to truthful rating in order to affect investors' demand. Then it uses its reputation to sell high rating to whoever issuer is willing to pay the high fee related to solicited high rating. Solicited or not, no fees can be charged in equilibrium for low rating since no issuer wants to pay for low rating.

The effect of strong priors on project default risk: In Mariano (2012), a CRA chooses today's rating in order to maximize its reputation for being a CRA who receives accurate information about default risk. She shows that a CRA that is uncertain about the correctness of its private information will tend to issue the rating that will most likely match the outcome of the issuer's project. In particular, when the prior probability of a project default is sufficiently large or sufficiently small, the CRA ignores its private information and issues a rating that conforms to the prior probability.

The effect of the urge to build up reputation: When reputation regards the accuracy of a CRA's private information, higher reputation tends to come with higher profits for the CRA. However whether reputation provides the right incentives for a CRA to give truthful rating depends on the patience of the CRA. Jeon and Lovo (2012) study the case of a CRA whose profits depend on its reputation for having

accurate private signals. In an infinite period model, they show that there are equilibria where a patient enough monopolist CRA will be able to commit to the truthful rating policy so that the actual accuracy of its private information will be eventually known. However, reputation can have the opposite effect for an entrant CRA that, in order to survive, has to overtake a reputation threshold within a finite period. The need to build up reputation within a finite number of periods makes truthful rating policy no longer credible. The only credible rating policies are those where the correlation between the CRA's rating and its private information is small. As a result, in equilibrium, the public cannot learn about the actual accuracy of the entrant CRA's private information.

The effect of informed issuer: When issuers are privately informed about the quality of their projects, a CRA's profit is not necessarily a monotonic function of the CRA's reputation for providing truthful ratings. This is true particularly when a decrease in a CRA's reputation is associated with an increase in the probability that the CRA will issue a high rating no matter its private information (Bouvard and Levy, 2012, Frenkel, 2011, Fulghieri *et al*.). Consequently, in terms of reputation building, a CRA has an incentive to compromise between the conflicting demands of issuers and investors. When the CRA's reputation for accuracy is too low, its ratings have little value to issuers because they will not affect investors' demand. In this case a CRA will benefit from an increase in reputation and will adopt an accurate rating policy. However, a CRA having a too strong reputation for being accurate will not attract issuers whose project quality is low. In this instance, the CRA will benefit from gaining some 'reputation for inflating rating' in order to attract issuers with low

quality projects as well as high quality issuers. In particular, Frenkel (2011) shows that in addition to the public reputation a CRA can build up with investors, a CRA can build up a private reputation with informed issuers. This is possible because, unlike investors, informed issuers can use their private knowledge of the quality of their rated projects to better detect the CRA's type. By establishing a private reputation for being lax, a CRA can attract more issuers without deteriorating its public reputation with investors. Hau, Langfield and Marques-Ibanez (2012) find empirical evidence supporting Frankel (2001)'s view. They find that CRAs assign more positive ratings to large banks and to those institutions more likely to provide CRAs with additional securities rating business (as indicated by private structured credit origination activity).

The effect of naïve investors and rating shopping: As for the case of CRAs with commitment power, the presence of naïve investors weakens the link between a CRA's reputation and the price it can charge for its rating and hence induces a CRA to inflate their rating. Also rating inflation is likely when issuers can choose not to have negative rating publicized and when the CRA can charge higher fees for publicized rating (Bolton *et al*., 2009). Griffin and Tang (2011) find evidence that within the same CRA, the assumptions used by the issuance division lead to more inflated ratings of CDOs than the assumptions used by the surveillance division. Since the surveillance division has less conflicts of interest than the issuance division, their finding can be regarded as an evidence of conflicts of interest leading to rating inflation.

2.4. Competition and entry

Information and allocative efficiency can suffer from an increase in competition among CRAs. A number of papers have studied the effect of moving from a monopolistic CRA to a duopoly (Bar-Isaac and Shapiro, 2012, Bolton *et al*., 2011, Bouvard and Levy, 2012, Doherty *et al*., 2011, Mariano, 2012). Although investors could obtain more information in a duopoly, the room for rating shopping increases when issuers can choose which rating to publicize (Bolton *et al*., 2011, Skreta and Veldkamp, 2009). When disclosure of rating is mandatory and issuers can obtain multiple ratings, they will be more concerned about the total amount of information provided by the CRAs' ratings. As a result it can be optimal for each single CRA to reduce the accuracy of its rating (Bouvard and Levy, 2012). When multiple ratings are not possible, increased competition reduces rating fees and affects CRAs' incentives to invest in private information acquisition. The reduction in rating fees resulting from increased competition can make a CRA more sensitive to bribery and capture (Strausz, 2006). This, together with the presence of naïve investors and/or informed issuers, might lead a CRA to opt for a rating policy that is more lax than the one resulting from a monopolistic CRA. Overall, the net effect that an increase in CRA competition would have on welfare ultimately depends on several parameters of the models and there is not an unambiguous answer to whether or not more competition in the CRA business is beneficial to social welfare.

Whereas it is unclear whether competition among CRAs is socially desirable, a different question is the one of entry of new CRAs. Ideally, in the presence of a

monopolist CRA delivering ratings of questionable quality, free entry should allow a more efficient entrant CRA to replace the incumbent in its monopolistic position. In practice, at least by 2000, lack of entry of new CRAs has been a persistent characteristic of the credit rating industry:[20]

"Since early in the 20th century, credit ratings have been dominated by a duopoly – Moody's and Standard & Poor's. …Only recently has a third firm – Fitch – been able to develop a toehold in some specialized submarkets." (Coffee, 2006, p.284).

This lack of entry can be attributed at least partly to the NRSRO designation process, which creates an artificial entry barrier: a potential entrant cannot get the NRSRO designation until it becomes 'nationally recognized' but it cannot become 'nationally recognized' until it receives the NRSRO designation that gives legal effect to its ratings.

Would the abolition of artificial barrier to entry allow an entrant CRA with a better default-risk assessing technology to replace the current incumbents? To survive an entrant CRA will have to make profits and for this it needs to build up its reputation for providing ratings that are more accurate than those of the incumbent. This can result in a natural barrier to entry. Within two-period models, Mariano (2012) shows that because issuers have a preference for a CRA with stronger reputation, an entrant CRA whose reputation is below the incumbent's will not enter because it will not be hired. Jeon and Lovo (2012) consider the case of an entrant

[20] Even if the SEC designated seven new NRSROs between 2003 and 2008, this has had little substantial effect (see Section 2.2).

CRA that is given any finite trial period during which it tries to build up its reputation for having an accurate technology to assess default risk. At the end of the trial period, the entrant CRA survives only if its reputation is above that of the incumbent.[21] Within this framework, truthful rating policy is not credible for the entrant CRA. Truthful transmission of a bad signal would induce no implementation of the rated project, no project outcome, no evidence about the CRA's rating correctness, and hence, no chance to build up reputation. This makes the survival of the entrant CRA impossible. This presence of a natural barrier to entry would put incumbents in such a comfortable situation that they might have little incentive to improve their rating technology, which could explain their failures during the last financial crisis. Entry is possible only after an exogenous fall in the incumbent CRA's reputation below entrant's initial reputation. This prediction is consistent with the sharp increase in the number of new NRSROs following what the public considered rating mistakes by the main CRAs during the recent financial crisis.

[21] The fact that an entrant CRA has a finite deadline for reaching a reputation threshold can be interpreted as a sort of financing constraint. Still the mechanism leading to an entry barrier is different from the one in Klein and Leffler (1982), Shapiro (1983) or Allen (1984) where financially-constrained firms do not enter because they cannot recover the initial loss for the period of reputation building. In Jeon and Lovo (2012), the fact that in equilibrium an entrant CRA's policy cannot reflect its information makes it impossible for the CRA to build up reputation even if it is given an arbitrarily long but finite reputation-building grace period.

4. Concluding remarks: some policy implications and directions for future research

We have seen that CRAs affect issuers' cost of capital through three channels: regulation, coordination and information. While financial regulations based on CRAs' ratings tend to reinforce the self-fulfilling power of ratings through the coordination channel, they have an opposite effect on information content of ratings as it reduces CRAs' incentives to analyze issuers' intrinsic qualities and/or to publicize negative ratings truthfully.

The existing theories offer a wide span of policy implications for improving reliability of ratings and reducing CRAs' conflicts of interest. Below we describe some of them.

First, the current system based on the issuer-pays pricing can be improved by mitigating CRAs' conflicts of interest. This can be achieved by making CRAs' publications of ratings mandatory in order to eliminate issuers' rating shopping. Also, the upfront payment of rating fees (i.e. fees should not be contingent on the actual rating)[22] can reduce CRAs' temptation to be lax. Reputational concern, which the CRAs argue is the key force that reduces conflicts of interest, has its own drawbacks as it generates a natural barrier to entry and induces CRAs to be lax when dealing with informed issuers. These issues can be solved by breaking the link between a

[22] It is called the Cuomo plan, which is an agreement between the former New York State Attorney General Andrew Cuomo and the three main CRAs. The plan aims at reducing conflict of interest resulting from the CRAs' widespread practice of charging higher fees for more favorable ratings.

CRA's reputation and its ability to attract issuers. For example, one could make it mandatory for issuers to systematically change their CRAs, in the same spirit as what happens for auditing companies. A stronger measure would be to centralize the matching between CRAs and issuers. The Section 15E(w) system, mentioned in the Dodd-Frank Act, that gives a CRA Board the role to assign issuers to NRSROs goes in this direction. The criteria for assigning CRAs to issuers, however, should be carefully designed to induce CRAs to produce accurate ratings and to give entrants a chance to build up reputation.

Second, a more drastic change of the business would be to move towards the investor-pays model. This can solve both rating inflation and the conflicts of interest stemming from the issuer-pays model. However, this could create free-riding among investors. Furthermore, absent the conflicts of interest, moving from issuer-pays to investor-pays model can reduce social welfare as shown by Stahl and Strausz (2010).[23] In addition, the investor-pays model might create its own conflicts of interest between investors and CRAs (SEC, 2012). Instead of choosing a unique model between the issuer-pays and the investor-pays model, one can encourage competition between the two different models by creating a level playing field. For

[23] They show that when a monopolist certifier is exogenously committed to truthful rating, it will prefer being paid by the issuer and that the equilibrium of the issuers-pay model leads to higher social welfare than the equilibrium where rating fees are paid by investors. It would be interesting to extend their analysis to the case of a certifier that is opportunistic not only in the choice of the rating fees but also in the choice of the rating policy.

instance, in the recent study of the SEC (2012), they consider an investor-owned CRA model where issuers would be required to obtain one rating from an NRSRO and another from an investor-owned CRA.

Third, at least in Europe the opportunity of building a public certification institution (PCI) is a central question in today's regulatory debate (Sénat, 2012). For the time being, this has been given little attention in the academic literature. Linking regulations to the PCI's ratings rather than to CRAs' ratings has several advantages. First, rather than outsourcing the rating criteria from profit maximizing companies, regulators could choose the relevant criteria to determine ratings. For instance, CRAs' ratings do not distinguish between which fraction of the default risk comes from idiosyncratic factors and which one from systematic factors. Having such a distinction might have helped avoiding the bubble on Mortgage Backed Securities and Collateralized Debt Obligations whose burst was at the root of the recent financial crisis. Second, in comparison to private CRAs, a PCI would be more entitled to enjoy any regulatory rent. Also depriving CRAs of their current regulatory rent would force them to focus more on the information content of their ratings. On the other hand, it is unclear whether the net social cost related to setting up a PCI, which would be needed to build up credibility and reputation, would be inferior to the social cost related to using already established CRAs. In any case, the incentives and rating criteria guiding a PCI rating need to be carefully designed to make its ratings credible to investors and desirable to issuers. More research in this direction is needed.

Fourth, regulations could exclusively be based on the market prices of credit default swap (CDS) or other default-risk derivatives.[24] This would have the advantage of saving the cost of a PCI and eliminating the CRAs' conflict of interests coming from the regulation channel. However, whereas CRAs ratings are relatively stable and tend to "rate through the cycle",[25] the same cannot be said for CDS prices. That is, a regulation based on market prices should be fine-tuned to take into account price volatility. This raises a number of open research questions. What would be the socially optimal frequency for ratings updates? What would be the profit-maximizing frequencies for CRAs to update their ratings? Would an appropriate design of a CDS-price-based rating achieve the socially optimal frequency?

Fifth, eliminating regulatory references to ratings, as is done by the Dodd-Frank Act, at first would induce investors themselves to gather more information and to be less naïve (Kurlat and Veldkamp, 2012) and, second would induce CRAs to provide more informative ratings. However, we do not think that the current state of the theory is conclusive on this point. In fact, in the vast majority of theoretical papers we have considered, they completely ignore the conflict of interest between institutional

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[24] Hilscher and Wilson (2012) find that ratings are strongly related to a straightforward measure of systematic default risk and that this systematic risk measure is strongly related to credit default swap risk premium.

[25] Bar-Issac and Shapiro (2010) consider a model of reputation based on grim-trigger strategies that incorporate economic shocks. They focus on the channel from the analyst labor market and show that CRA accuracy may be countercyclical. Harald, Langfield and Marques-Ibanez (2012) empirically find that rating accuracy is countercyclical in the case of ratings for banks in U.S. and Europe.

investors and their clients, which is the original reason for imposing rating-based regulations on institutional investors. It would be nice to have papers that consider both the conflicts of interest of institutional investors and CRAs'.

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Figure 1: Credit rating agencies as an intermediary in a two-sided market