

## **Rating Agencies and Reputational Capital – A Survey of Current Evidence with New Empirical Results**

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*Credit ratings play an important role in many capital markets. Ultimately, rating agencies are supposed to produce accurate ratings so as to gain 'reputational' capital. Beyond SEC supervision corporate ratings are regulated by double (or triple) ratings – the so called two-rating norm, where each agency is de facto overseen by other agencies. This paper investigates the relevance of credit ratings for corporate bonds in the US-market and 25 other countries and thereby the suitability of ratings for international comparisons. The explanatory power of financial ratios for corporate default probability and their dependence on firm size is investigated. Furthermore the question is addressed whether the concern for reputational capital could drive agencies to produce accurate and reliable ratings. For this we review the empirical literature with respect to results that are relevant to reputational capital and the effects of firm size. We conclude that in corporate and sovereign markets agencies seem to try to obtain reputational capital, in contrast to the market for structured finance products, in which they might have sold regulatory licences. A survey of the 100 largest non-financial public firms in 26 countries is included to determine which ones are rated by S&P over time. We find that in many developed and developing countries credit ratings are still rare. In our sample only all US corporations have a rating, making an international comparison difficult. With an ordered probit panel analysis for the US corporations of our sample from 1990 - 2009 the effects of standard firm specific variables and their comparison to results in the literature are evaluated. Empirical evidence can be interpreted as a concern for reputational capital on behalf of rating agencies. Standard explanatory variables do not achieve significant effects in our US-sample, which indicates that variable coefficients could depend among others on firm size.*

**JEL Codes:** F34, G18, and G24

**Keywords:** Rating agencies, credit ratings, reputational capital, creditworthiness

### **1. Introduction**

In 1975 the US Securities and Exchange Commission (SEC) gave certain credit rating agencies (CRA) the status of nationally recognised statistical rating organisations (NRSRO) (Coskun 2008). These rating agencies thereby became part of financial market regulation (Coskun 2008; Hill 2004; Partnoy 1999; Altman et al. 2010). The regulation of rating agencies has focused on increasing competition (Coskun 2008) and decreasing conflicts of interest (Altman et al. 2010). Competition can lead to self regulation on the rating agency market, for instance in the case of multiple ratings (Bongaerts et al. 2012).

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The main issue of CRA regulation is that private profit seeking firms are used to regulate financial markets. The main premise of this regulation is the assumption that CRAs seek reputational capital.

The classical view of CRAs is that they try to gain a reputation by producing accurate ratings and provide additional information to investors to minimise information asymmetries. An alternative view of CRAs is the regulatory license view proposed by Partnoy (1999). He argues that ratings are important on financial markets not because they provide additional information but because of the regulatory power they have been given. This power gives rating agencies the ability to sell regulatory licenses as access to financial markets for bond issuers.

Rating agencies assess the creditworthiness of different kinds of issuers: corporations, sovereign governments, and special purpose vehicles that issue structured finance products. On these markets competition between rating agencies and conflicts of interest are not equally useful or likely (Rosner 2009; White 2010). To understand on which markets CRAs seek reputational capital or where they sell regulatory licenses an individual market analysis is required.

Research on ratings focuses on three main fields: default studies, financial market reactions, and determinants of credit ratings (Blume et al. 1998). Default studies mainly focus on the correlation between rating classes and their default probability (Zhou 2001). Capital market studies analyse the efficient market hypothesis and if ratings provide additional information to markets (Gonzales et al. 2004). In studies analysing the determinants of credit ratings the through-the-cycle approach of CRAs can be seen (Altman & Rijken 2004). CRAs try to rate independently of the business-cycle in contrast to point-in-time methods.

In this paper the empirical literature is analysed with regard to the issue of reputational capital and regulatory licenses. We provide an analysis of individual rating markets with respect to the supply and demand side of bonds, the business model of rating agencies on that market, and the availability of the necessary information to estimate default probability. An individual market is made up by CRAs on the supply side and debt issuing entities on the demand side, as debt issuers pay (or not) the CRA to rate their credit quality. Specifically, we analyse the corporate rating market, the sovereign bond market, and the structured finance products market. Most other studies only distinguish between corporate and sovereign ratings on the one hand and structured finance products on the other. Based on our literature review we develop an empirically testable hypothesis to test if CRAs have been seeking reputational capital while rating corporate debt.

For firms and structured finance products research has mostly focused on US-markets. Yet ratings gain in informational value if they can be compared to as many other ratings as possible (Widdowson & Wood 2008; Hill 2004): across industries, within countries, and internationally.

The global financial crisis of 2008 and the ongoing sovereign debt crisis have increased the focus on rating agencies. Rating agency regulation has since been a priority in the USA and the EU. We conduct a survey of the 100 largest public non-

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financial firms in 2005 in 26 countries whether they have a S&P rating. We find that outside the USA ratings are less common.

Corporate creditworthiness is largely determined by accounting ratios. McLeay & Trigueiros (2002) provide a theoretical concept for the relationship of ratios and firm size. We discuss the empirical findings that describe the relationship between firm size and creditworthiness. In contrast to most other studies we argue to use firm size rather than credit quality to distinguish effects of variables on credit ratings. We support this approach with results from the literature and our own findings. In this, our sample selection plays an important role.

The paper continues as follows. In Section 2 we provide a review of the relevant literature and discuss the implication of their results for reputational capital and regulatory licenses. In Section 3 we present the data and discuss the results of an international survey whether firms have an S&P rating. Furthermore, the statistical methods used in this study are presented. Section 4 discusses the results of firm size and credit quality and reputational capital on the corporate bond market. Section 5 concludes.

## 2. Literature Review and Market Evaluation

We review the literature on credit ratings. First the different characteristics of rating markets are highlighted, the history of CRA regulation is presented, and the reputational capital and regulatory licence view of CRAs is given. We then review the empirical literature of credit ratings concerning capital market reactions and determinants of corporate, sovereign, and structured finance ratings. Next, we analyse the individual rating markets with regard to reputational capital and regulatory licenses. Last but not least, we provide a review of the statistical methods used to estimate and forecast credit ratings.

### 2.1 Rating Markets and Rating Agency Regulation

The individual rating markets are analysed with regard to the supply and demand side of bonds and who pays for the rating. These properties vary across the corporate, sovereign, and structured finance markets. The history of CRA regulation, specifically in the USA, provides the legal background of this study, and is essential in understanding the alternative views of reputational capital and regulatory licences of CRAs.

#### Rating Markets

Corporate bonds are the traditional products agencies rate. Here, a large number of issuers provide bonds to international investors (Rosner 2009). Ratings are issuer-paid since the early 1970s' and investors usually demand more than one rating. Most of the relevant information is publicly available and there are alternative approaches to determine default probability, one instance is the Z-Score developed by Altman (1968). Furthermore the market has low liquidity risk (Rosner 2009).

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On the sovereign bond market governments sell bonds to a large number of international investors (Rosner 2009). Ratings are investor-paid and generally unsolicited. The relevant information is publicly available and ratings are provided by all the big agencies so that multiple ratings exist.

Structured finance products are provided by a small number of investment banks sold mainly to institutional investors with investment restrictions subject to NRSRO ratings. Ratings are issuer-paid, and bonds often only have one rating (Benmelech & Dlugosz 2010). There is little history and experience on the creditworthiness. Furthermore, the relevant information is hard to obtain publicly and markets have high liquidity risk (Rosner 2009).

### Rating Agency Regulation

After the 1929 crash demand for ratings grew as investors became concerned about defaulting bonds (Partnoy 1999). Rating regulation started in 1936 when banks were forced to use 'recognised' rating manuals. Ratings thereby received the force of law (White 2010).

Numerous defaults in the 1970s' led to a growing focus on the safety of debt and increased the demand for ratings (Hill 2004). Since 1973, ratings have become incorporated in hundreds of rules for securities, pensions, banking, real estate, and insurance regulation. The SEC adopted the first rule that incorporated ratings from an NRSRO. This change in regulation gave agencies the opportunity to sell regulatory licenses and establish themselves as gatekeepers to the bond market (Partnoy 1999). In reaction to the Enron crisis of 1999/2000 the Sarbanes-Oxley Act was passed in 2002, which in turn led to the Credit Rating Agency Reform Act of 2006. The main aim of this legislation was to increase competition on the credit rating market (Coskun 2008). The sub-prime mortgage crisis of 2008 led to the Dodd-Frank Act of 2010. Here regulation was to focus on reducing conflicts of interest (Altman et al. 2010).

Beyond government and SEC regulation, the credit rating market is also internally regulated through the so called two-rating norm. Here investors demand more than one rating. In this case the additional rating need not add further information but is used to certify the first (Bongaerts et al. 2012).

A critical governing issue of rating agencies is their compensation. The largest agencies are now mostly issuer-paid, a business model which commenced in the 1970s', as before they used to be solely investor-paid; this is still true for many smaller agencies. The issuer-pays model could lead to conflicts of interest for rating analysts. These conflicts have been blamed for the credit rating crisis of 2008 (White 2010).

### Reputational Capital and Regulatory Licenses

Partnoy (1999) contrasts two alternative perceptions of the role of credit rating agencies on capital markets and why they are successful. On the one hand, there is the classical reputational capital view of rating agencies, and on the other hand there is the regulatory license view developed by Partnoy himself.

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The reputational capital view of rating agencies argues that by producing accurate ratings, agencies add additional information to capital markets and reduce information asymmetries. The agencies gain more reputation as they continue to produce accurate ratings. Investors are then willing to pay for these ratings. Furthermore, issuers are willing to pay agencies to rate them because it enables them to signal superior credit quality.

The regulatory license view of rating agencies argues that the success is not based on their ability to provide information, but on their legally privileged position which allows them to sell regulatory licenses to issuers.

### 2.2 Empirical Research

In this survey of the empirical literature we present some general themes and results that have been researched. These results of the empirical literature are the basis on which the assessment of reputational capital and regulatory license is performed. Specifically, we review the way in which ratings affect capital markets. Furthermore, we analyse the results of studies that estimate the determinants of credit ratings, in particular the way in which firm size and credit quality are related.

#### Financial Markets and Corporate Ratings

Default and transition studies are published regularly by all NRSROs. Former studies by Jorion & Zhang (2007) and Zhou (2001) highlight the ordinal character of credit ratings. Defaults document that credit ratings convey information insofar as that higher rated firms on average default less often than lower rated firms and are therefore of higher credit quality.

Event studies analyse the efficiency of markets. Here one argues that if markets react to credit rating changes, they cannot be efficient as ratings add information to the markets. Empirically, rating changes have been analysed on bond markets (Katz 1974; Goh & Ederington 1999), stock markets (Pinches & Singleton 1978; Followill & Martell 1997; Jorion & Zhang 2007), and for credit default swaps (CDS) (Micu et al. 2004; Carthart et al. 2010).

Prior to rating agencies receiving NRSRO status, Katz (1974) finds that bond holders rely on credit ratings. Pinches and Singleton (1978) conclude that rating agencies lag behind the stock market. This could imply that agencies provide no additional information and just follow market prices. But agencies also provide placements on watch-lists prior to rating changes. Holthausen and Leftwich (1986) find that these watch-list placements have an effect on stock markets.

The additional informational content of ratings also depends on how much more information agencies have compared to other market participants (Jorion et al. 2005). Micu et al. (2004) find that rating changes cause dynamics on CDS markets. Cesare (2006) measures if market-based indicators can predict rating changes. He finds that ratings still add information to markets, although measures based on bond prices, stock prices, and CDS anticipate rating changes. Specifically, CDS are good indicators for negative and stock prices for positive events.

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The lagging of actual rating changes to movements on markets and market-based measures highlight the through-the-cycle approach of agencies. This gap to point-in-time approaches could be partly closed by the use of outlooks and watch-list placements (Altman & Rijken 2007).

Overall, rating agencies seem to provide additional information to market participants. At least markets, either voluntarily or forced by regulation, will act on ratings.

### Determinants of Corporate Ratings

These fall into three main categories: financial ratios, corporate governance (CG), and macroeconomic effects. Ratios are traditionally used in corporate default prediction. CG variables determine corporate success and creditworthiness with respect to management control and supervision. With regard to macroeconomic variables CRAs have a through-the-cycle approach.

Financial ratios have classically been used to predict corporate defaults (e.g. Altman 1968). In the literature there are usually two sets of variables used: the Altman-set, and the S&P-set. The Altman-set is based on those variables used by Altman (1968) for default prediction (for instance used in: Altman & Rijken 2004; Kim & Sohn 2008). The S&P set used prominently by Blume et al. (1998) is based on ratios S&P indicated as being important in their rating decision.

The fact that variables which determine credit ratings also correlate with default probability indicates that credit ratings incorporate information about the creditworthiness of corporations. Yet, ratings should contain more information than can be derived via a formula from publicly available financial statements.

Credit ratings also incorporate information on management quality and corporate governance. Some authors (e.g. Amato & Furfine 2004) use the market-beta to proxy for management quality. Research on the effect of corporate governance on credit ratings focuses on mechanisms that influence the principal agent problem (Bhojraj & Sengupta 2003) and wealth redistribution (Ashbaugh-Skaife et al. 2006). The principal agent problem addresses the potential conflict between management and all stakeholders (equity and debt). The separation between ownership and control leads to information asymmetry. Institutional ownership and board structure influence credit ratings if they increase oversight and control management. A possible conflict between bondholders and stockholders is encapsulated in the wealth redistribution hypothesis. Stockholders could induce the management to increase dividends by conducting riskier investments (and thereby increase default risk), or transfer wealth from bondholders to stockholders by paying dividends with borrowed capital. Ashbaugh-Skaife et al. (2006) find evidence of this relationship as they find a negative effect for the number of block owners and the number of shareholder rights on credit ratings.

The so-called through-the-cycle approach leads to rating stability (Altman & Rijken 2004). Furthermore, Amato & Furfine (2004) argue that credit ratings are not unduly influenced by the business cycle. Using a factor probit model to predict rating transition-matrices, Feng et al. (2008) highlight the effect the business cycle has on

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credit ratings. They argue that the correlation to the business cycle implies that agencies apply a point-in-time approach. Yet, as Amato & Furfine (2004) point out, the individual business risk factors of corporations can exhibit cyclical behaviour which can cause the cyclical behaviour of ratings.

### Firm Size and Credit Quality

Firm size has a significantly positive effect on credit ratings, found in every study. Jorion et al. (2009) note that on average investment grade firms are nine times as large as speculative firms, as measured by market value. Blume et al. (1998) find that financial ratios are more important for larger firms than smaller firms.

Other studies also measure differing effects across firm size. Yet, in contrast to Blume et al. (1998), they do not distinguish along firm size but along credit quality. Specifically, they perform separate analyses for speculative and investment grade firms. Amato & Furfine (2004) find that investment grade firms are more sensitive to the business cycle. For corporate governance mechanisms, Bhojraj & Sengupta (2003) find that these mechanisms are more important in determining credit risk for speculative grade firms. Furthermore, Jorion et al. (2009) show that the yearly dummy variables of the fixed effects panel model only decline over time for investment grade firms. Blume et al. (1998) had previously interpreted this decline as an increase in rating agency stringency. Further, Jorion et al. (2009) argue that the increase in stringency is due to a decline in accounting quality. In particular, they propose that investment grade firms are more likely to engage in earnings management, and their accounting numbers are less trusted by CRAs.

The distinction between investment grade firms and speculative firms is problematic as credit quality, if measured by the credit rating, is the dependent variable. If credit quality is used, a different measure could be used, such as credit spread or Altman's Z-Score. It could also be tested if firm size can be substituted for credit quality, as it offers the possibility to use an independent variable. Such an approach is as yet missing in the empirical literature.

The theoretical assumptions underlying the relationship between firm size and financial ratios are investigated by McLeay & Trigueiros (2002). They argue that the validity of using ratios requires that proportionate changes in ratio components should be independent of size. Under this condition, firm size may be modelled as a common effect specific to each set of financial statements, and mechanisms equating continuously compounding growth rates proportionate to firm size may lead to more valid ratios.

### Sovereign Ratings

Beyond the traditional corporate bond market for rating agencies, more and more sovereigns have been rated over time. Sovereign governments were looking for entries to capital markets to refinance themselves.

Cantor & Packer (1996) show an existing correlation between sovereign ratings and yield spreads. Moreover, sovereign rating changes affect the stock markets of those

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countries, possibly leading to instability in financial markets (Kaminsky & Schmukler 2002).

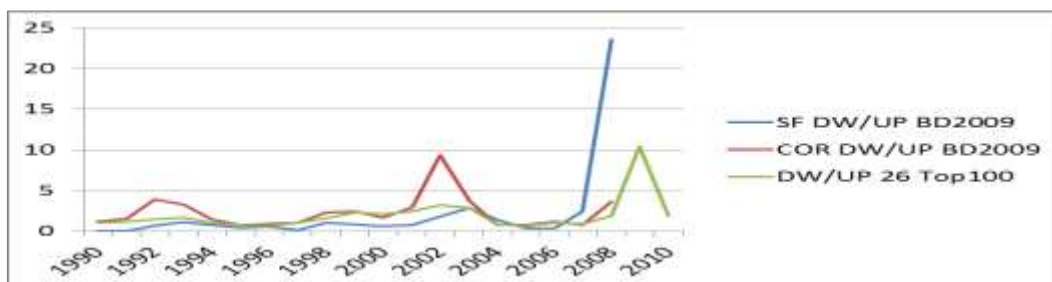
Economic determinants of sovereign creditworthiness are per capita income, GDP growth, inflation, and the government's external debt (Cantor & Packer 1996). Furthermore, measures for economic development (Cantor & Packer 1996) and government effectiveness (Afonso et al. 2011) are significant determinants.

The difference between rating agencies is often compared in sovereign rating studies. Hill et al. (2010) find that the big three agencies have a set of common variables that all agencies use, but there are individual sets of variables that cause ratings to differ slightly across agencies.

### Structured Finance Products

Ratings for structured finance products are determined by assumed default probabilities of the individual mortgages that underlie them (Standard & Poor's 2009). Structured finance products are distinguished in some crucial points from corporate and sovereign bonds (Rosner 2009), one is that they have more complex legal structures. Corporate assets are dynamic and actively managed in contrast to structured finance products, where assets are static. Moreover, corporations determine their own corporate structure, while the corporate structure of structured finance products is defined by the rating agencies criteria.

**Figure 1: Ratio of down-grades to up-grades for the international 'top 100' sample with S&P ratings '26 Top100' and from Benmelech & Dlugozs (2010) 'BD2009' corporates 'COR' and structured finance products 'SF' of Moody's ratings.**



In Figure 1 the downgrade to upgrade ratio is displayed for Moody's ratings of US corporate bonds and structured finance products (source Benmelech & Dlugosz 2010), as well as the sample of S&P ratings of corporations used later in this study. It can be seen that structured finance products experienced much stronger downgrades in 2008 (the peak of the sub-prime mortgage crisis) than corporate bonds at any time. The high ratio of downgrades to upgrades indicates that ratings for structured finance products were inflated.

The cause of this inflation is possibly rating shopping. An indicator for rating shopping is that issues with only one rating were more likely to be downgraded than issues with two or more ratings (Benmelech & Dlugosz 2010). Only the best rating



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could have been published in the case of split ratings. Furthermore, Griffin & Tang (2011) found that a rating agency had positively adjusted ratings beyond their models.

### 2.3 Critical Evaluation of Markets and Reputational Capital

The structure of each rating market is sketched in 2.1 and the results of empirical studies presented in 2.2, to attempt to determine if CRAs are trying to generate reputational capital, or if they are selling regulatory licenses. Recall that CRAs seeking reputation on financial markets is essential to their legitimacy to regulate financial markets.

#### Corporate Markets

Given the structure of the market for corporate ratings, with many issuing corporations and an oligopoly of CRAs, agencies have a low risk of being substituted for another agency or CRA substitution having dire economic consequences. Investors demand more than one rating so that a rating agency like S&P can be almost certain to receive the fee for rating an issue. So even though corporate ratings are issuer-paid, the possibility for conflicts of interest do not seem to be severe. This holds in particular if investors' investment decisions are not subject to rating restrictions (as is the case for private investors) and ratings are used as confirmation of their own analysis. Therefore, without regard to the issue whether ratings provide additional information, agencies can provide the service of confirming and assisting investor analysis.

With regard to the informational content of credit ratings and market reactions, the issue of reputational capital is more difficult. The evidence that rating changes can be predicted using market based indicators does not necessarily imply that ratings do not add information to markets. First, market-based measures of creditworthiness have a point-in-time perspective. In contrast, CRAs provide a through-the-cycle assessment. Overall, ratings, market based measures, and Altman's Z-Score are correlated yet distinctly alternative measures of creditworthiness. One cannot argue, as Partnoy (1999) does, by assuming that all the information is reflected in the bond spread, that ratings are inaccurate because not all the bonds in one rating category have the same bond spread, and then argue that ratings provide no additional information. Second, market prices might reflect all the information investors have, but ratings should definitely not incorporate one element that can be included in market prices, namely speculation. Therefore, if rating agencies provide an accurate assessment without skewing their judgement through conflicts of interests, they should provide the markets if not with additional information, at least with information free of profit seeking speculation.

With regard to the accuracy of the actual rating, the results of Blume et al. (1998) and Jorion et al. (2009) may be interpreted as follows: if rating agencies had been influenced by conflicts of interest under the issuer-pays model, they need not have reacted to the decline in accounting quality. They could have allowed ratings to inflate. This therefore implies that agencies sought to further obtain reputational capital. In Section 3 we develop an empirically testable hypothesis from these results with regard to reputational capital. This presents a new interpretation of the results

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which has been previously ignored in the discussion on reputational capital. This aspect is further discussed in section 4.

### Sovereigns Markets

Ratings for sovereign governments are correlated with economic growth measures and yield spreads of sovereign bonds. Moreover, rating agencies are in a position in which issuers cannot pressure them; the ratings are unsolicited. The investor-pays model for sovereign ratings avoids the conflict of interest between CRA and issuer. This implies that CRAs must rely on the reputation they gain from producing accurate ratings. Nevertheless, two issues remain. First, it is questionable if agencies add information to sovereign bond markets if they only use publicly available information<sup>1</sup>. Furthermore, the investor-pays model might lead to conflicts of interests with investors. Investors could demand lower ratings and thereby higher yield spreads on issues of low risk (Richardson & White 2009). This would essentially deflate ratings.

### Structured Finance Market

The market set-up and the empirical evidence for structured finance products has led to scholarly agreement (Altman et al. 2010; Calomaris 2009; White 2010; Levine 2010) that CRAs tried to sell regulatory licenses in the build-up to the 2008 financial crisis. Investors were seeking bonds with high ratings and high yield spreads. CRAs could easily be put under pressure by an individual issuers, as there were few issuers (White 2010) and CRA revenues were highly dependent on structured finance products (Altman et al. 2010). The empirical evidence is compatible with the hypothesis of rating shopping. Moreover, since the financial crisis of 2008, S&P has noted that many issuers who do not receive a AAA rating are unwilling to publish their rating (Standard & Poor's 2012).

## 2.4 Statistical Methods Review

There are a number of statistical procedures to estimate and forecast credit ratings and credit rating changes. They differ in the underlying assumptions they make. Ederington (1985) compares ordinary least squares (OLS), ordered probit, unordered logit, and multivariate discriminate analysis (MDA) methods for estimation and out of sample prediction of ratings. OLS and ordered probit are ordered methods, meaning that the ratings as independent variables are assumed to be ordered to credit quality. For OLS an issue arises, as it assumes that the distance between each rating category measured in credit quality is the same. The ordered probit approach addresses this problem as it allows for an ordinal scale. Yet, both ordered methods assume that the coefficients of the explanatory variables remain constant overall rating categories. Without assuming the ordered character of ratings the unordered logit and MDA method can allow for varying coefficients. Ederington (1985) finds significantly differing effects for the explanatory variables. His results show that the unordered logit and ordered probit approach respectively outperform the OLS and MDA approach. Furthermore, logit performs best in in-sample estimation and probit in out-of-sample prediction.

Most present studies employ the ordered probit method (e.g. Blume et al. 1998; Amato & Furfine 2004; Ashbaugh-Skaife et al. 2006; Mählmann 2011). Due to its a

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priori assumptions (ordered structure and ordinality) the ordered probit method is the most intuitive approach, but it comes at the cost of assuming a constant influence of variables across rating classes (further examples follow below).

In the context of panel analysis the ordered probit approach presents another difficulty. It assumes a point-in-time perspective of default probability in contrast to the agencies' through-the-cycle approach (Altman & Rijken 2004). This is problematic if rating changes are forecasted, as in Amato & Furfine (2004). Consequently, rating transition studies commonly use forms of duration or hazard methods (e.g. Du & Suo 2005; Koopman et al. 2008).

Some studies for rating transitions solely rely on predictors that are not firm-specific, except for the prior ratings. In many studies so called rating transition matrices are used to estimate transition probabilities (e.g. Lando & Skødeberg 2002; Kim & Sohn 2008).

### 3. Data and Methods

The data for this study consist of the ratings of a sample of the 100 largest public non-financial corporations of 2005 in 26 countries. This survey provides an overview of the international relevance of credit ratings. For the purpose of a panel analysis we collect firm specific variables of the US-firms of the sample to estimate the determinates of credit ratings. We present the selected variables, discuss their possible effects, and analyse their sample properties. The panel analysis is performed with an ordered probit and an unordered logit model.

#### 3.1 Data

Here the ratings and explanatory variables of this study are presented. The international survey of S&P ratings analyses the international relevance of credit ratings. Note that it is limited to that particular rating agency and might not necessarily reflect the distribution of Moody's ratings, although a high degree of correlation is expected, given the ratings policies of these two CRAs and the results of other studies using Moody's ratings (e.g. Nickel et al. 2000).

#### Ratings

Ratings range from AAA, assigned to firms with the highest debt quality, to D, which is given to firms in default. Ratings from AA to CCC can furthermore have a '+' or a '-' that indicates more subtle differences in creditworthiness. Ratings from AAA to BBB- are considered investment grade ratings, while BB+ and lower ratings are called speculative ratings. The difference between BBB- and BB+ is important, as for instance some institutional investors may not purchase bonds rated BB+ or lower (Hill 2004).

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**Table 1: International distribution of S&P ratings from 1990 to 2009 from 'top 100' non-financials in 2005.**

Country	90	91	92	93	94	95	96	97	98	99	0	1	2	3	4	5	6	7	8	9	Total Rated	Total
Australia	2	2	2	5	8	13	15	16	17	18	19	22	22	24	25	27	29	28	28	29	31	100
Argentina	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	3	3	3	3	56
Belgium	0	0	0	0	0	0	0	0	0	0	0	1	3	4	5	5	5	5	5	5	6	104
Brazil	0	0	0	0	0	0	0	3	4	4	5	6	6	8	8	7	8	10	12	12	16	103
China	0	0	0	0	0	0	0	0	1	1	1	2	2	3	3	3	3	3	3	2	3	100
Germany	0	1	1	2	2	4	4	5	5	7	15	17	18	19	21	24	23	23	23	22	25	100
Finland	0	0	0	0	0	0	1	1	2	4	5	5	6	6	6	6	6	6	6	6	6	101
France	2	3	5	5	7	9	11	14	16	18	22	26	27	27	30	32	32	32	31	32	35	100
India	0	0	0	0	0	0	1	3	4	4	5	5	5	5	6	8	8	8	8	8	10	105
Indonesia	0	0	0	0	0	0	0	0	0	0	0	0	1	2	2	4	7	9	9	9	11	107
Italy	0	0	0	0	0	0	0	0	1	2	4	6	6	9	10	11	10	10	9	9	14	100
Japan	9	10	12	15	16	16	17	21	20	23	24	26	29	78	87	86	88	76	75	46	90	100
Canada	2	3	5	7	7	12	15	21	24	27	31	45	45	49	51	52	51	49	49	51	61	103
Mexico	0	0	1	1	2	2	4	8	11	13	13	14	13	14	14	16	19	19	18	17	23	95
New Zealand	1	1	1	1	1	3	4	4	5	5	6	8	8	8	8	8	7	6	5	6	9	102
Netherlands	2	2	2	3	3	3	4	4	9	12	15	15	15	15	15	15	15	15	13	13	17	104
Russia	0	0	0	0	0	0	0	2	3	3	4	7	11	12	13	13	14	15	14	13	15	110
Saudi Arabia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	3	3	4	90
Sweden	0	1	2	3	4	4	4	8	8	8	12	14	14	14	14	14	14	15	15	16	16	104
Switzerland	1	1	1	1	1	1	1	3	3	4	5	6	6	7	7	8	9	11	11	10	11	104
Spain	0	1	1	3	3	3	4	5	5	5	7	7	9	9	10	10	10	10	8	9	11	100
South Africa	0	0	0	0	0	1	1	1	1	1	1	1	2	3	3	3	3	3	3	4	4	103
South Korea	0	1	3	3	3	3	4	4	4	4	4	7	7	8	7	9	9	10	12	13	14	103
Turkey	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	2	3	3	3	3	3	110

A survey of the 100 largest public non-financial corporations of 2005 in each of 26 countries is conducted to see if they have a foreign long term S&P rating. The sample is from 1990 to 2009, creating a panel data set of 2604 firms. The number of firms in any given country may depend on the status of the country's economic development, and on the way firms refinance themselves (financial markets or banks). In Table 1 one may see that the US sample is almost complete (the missing firm has a local long term rating). There is a large degree of rated firms in Japan, Canada, and the UK. Around a third of the sampled firms in France and Australia, and a quarter of the sample in Germany and Mexico are rated. In contrast, almost no firms are rated in China. Overall, the ratio of firms rated in a world-wide sample is small, around one fifth. Yet, this statistic is skewed, as the US, Japan, Canada, and the UK already contain more than half the rated firms (307). The strong over-representation of US firms is also noted by Nickel et al. (2000). In many developing countries the number of rated firms is low, as well as in some developed countries such as Germany. Especially in China, the second largest economy in the world, the number is very low. Curiously, geographic proximity to the USA seems to play a role. Canada and Mexico have a much larger ratio of rated firms compared to other economies which are larger or more developed.

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Over time the number of rated firms logically increases as not all firms existed in 1990. Nevertheless, the number of countries in which firms are rated increases over time as well. The sample is therefore less dominated by US firms from year to year. This is confirmed by a survey of S&P (Standard & Poor's 2011). The sample confirms the findings by Nickel et al. (2000) that rating agencies are more and more globally active. It can be seen in Table 1 that the number of rated firms in one year is often lower than the number of rated firms in the sample. The reason for this is that firms sometimes withdraw their rating. Strikingly, this is the case in Japan. Here, 29 firms withdrew their rating in 2009.

For our US-sample we compare our results with other studies, as these are usually limited to the US. Selecting our sample based on firm size helps us explore the relationship of firm size and credit quality.

### Explanatory Variables

We use financial data and ratios that measure factors such as leverage, liquidity, and profitability (see e.g. Blume et al. 1998). In this study we employ 10 variables extracted from financial statements in the spirit of both the S&P and Altman set. Following Blume et al. (1998), we use pre-tax interest coverage, operating income to sales, a long term debt ratio, a total debt ratio, and total assets. We employ two ratios suggested by Altman (1968) to predict corporate bankruptcy, which were later used in credit rating studies by Altman & Rijken (2004) and Kim & Sohn (2008). These ratios are the retained earnings to total assets, the earnings before interest and taxes (EBIT) to total assets (TA), sales to total assets, and return on assets (ROA). For both the ROA and the total debt-total assets ratio we include a five year average.

### Definitions and Possible Effects

Specifically, pre-tax interest coverage (IC) is operating income after depreciation plus interest expenses divided by interest expenses. Operating income is expected to be positively related to ratings. The operating income to net sales ratio (OI/NS) is defined as operating income before depreciation divided by net sales. This ratio is a proxy for both earnings and cash flow. A firm's earnings margin indicates whether it can generate the necessary cash to service its debt obligations. Moreover, the value of a firm's assets are measured by its earnings.

The long term debt ratio (LTD/TA) and the total debt ratio (TD/TA) are both measures of leverage. They are respectively defined as long term debt divided by total assets (LTD/TA) and the sum of long term debt, debt in current liabilities, and short term debt divided by total assets (TD/TA). Issuer ratings measure a firm's ability to service all its financial responsibilities, but are also linked to the issue rating of unsecured long-term debt. Therefore, a distinction between long-term debt and total debt seems appropriate to measure the magnitude of a firm's debt obligations (Amato & Furfine 2004). Furthermore, we include the five year arithmetic average of TD/TA (TD/TA5yr). These ratios should be negatively related to credit ratings.

Amato & Furfine (2004) consider firm size (TA) to be a measure of business risk. Larger firms tend to be older and have more diversified product lines and a higher

## Matthies

variety of revenues<sup>ii</sup>. Therefore firm size should be positively related to credit ratings<sup>iii</sup>.

In the spirit of Altman's (1968) default prediction model, Altman & Rijken (2004), and Kim & Sohn (2008), we include a retained earnings to total assets ratio (RE/TA). This ratio proxies the historic profitability of a firm, and furthermore implicitly measures the age of a firm, as older firms usually have a higher retained earnings to total assets ratio. The retained earnings can be used in less profitable times to ensure the service of obligations and should therefore be positively related to credit ratings. Similarly, the earnings before interests and taxes to total assets (EBIT/TA) is a proxy of the firm's current profitability (Altman & Rijken 2004). It measures the true productivity of a firm's assets (Altman 1968). A core element of a firm's existence including its creditworthiness is based on the earnings power of its assets. This ratio should therefore be positively related to credit ratings.

Return on assets (ROA) is a further measure of profitability. For individual firms the measure of profitability used by the rating agency may differ. Furthermore, we include the five year arithmetic average of ROA (ROA5yr) to test if we can thereby capture changes in the fundamental creditworthiness of firms.

### Sample Properties

**Table 2: Independent variable distribution across rating classes for 'top 100' US-firms.**

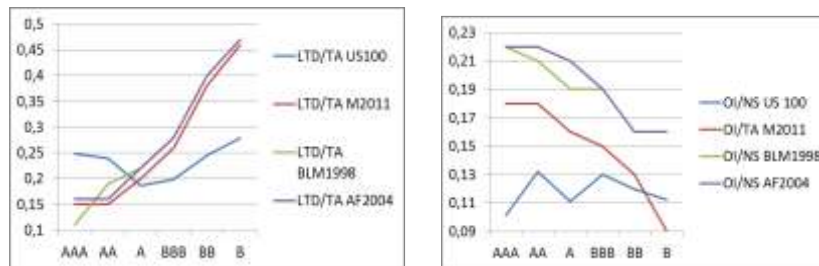
	AAA	AA	A	BBB	BB	B	CCC	D	NR
INT COV	1.1853	1.3588	1.2561	0.3619	1.4013	1.432	1.984	0.5523	1.7221
OI NS	0.1011	0.1322	0.1112	0.1302	0.1196	0.1121	0.1406	0.0958	0.1247
LTD TA	0.2483	0.2397	0.1862	0.199	0.2452	0.2787	0.3251	0.2888	0.2044
TD TA	0.316	0.2991	0.2409	0.2564	0.3007	0.3332	0.4427	0.3137	0.2554
TD TA 5yr	0.3074	0.2711	0.2379	0.2449	0.2909	0.3563	0.4153	0.3178	0.2224
TA	23.1965	25.0726	23.1174	22.5804	22.5392	22.6297	22.9782	21.8738	23.791
RE TA	0.2808	0.2783	0.3138	0.2909	0.2704	0.14	0.5122	0.2373	0.2435
EBIT TA	0.0887	0.1171	0.1175	0.1135	0.1043	0.0697	0.113	0.0741	0.1378
ROA	6.4585	7.3314	7.8556	7.7531	6.6365	4.5157	7.2933	3.4144	9.254

In Table 2, the mean values of the explanatory variables are given for each rating class as well as the not rated firms (NR). There seem to be no apparent trends for IC and EBIT/TA. The means of OI/NS increase down the rating scale. Because of this feature we might not be able to detect a positive relationship between OI/NS and credit ratings, despite the fact that this is documented in other studies (e.g. Blume et al. 1998). The TA variable shows a slight downward trend that indicates the expected positive relationship. This can be also said about ROA and ROA5yr. Except for CCC a downward trend can also be seen in RE/TA. The measures for leverage LTD/TA, TD/TA, and TD/TA5yr appear to be U-shaped. Overall, the distributions of the explanatory variables might make it difficult to measure significant effects.

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In Figure 2 we compare the distribution of selected ratio averages across rating classes. Specifically, the OI/NS ratio and the LTD/TA ratio are used for exemplary purposes. They highlight the ratio properties of our sample to the samples of other studies, namely Blume et al. (1998) (BLM1998), Amato & Furfine (2004) (AF2004), and Mählmann (2011) (M2011).

**Figure 2: Distribution of Long term debt to total assets ratio (left) and operating income to net sales/total assets (right) across rating classes from different studies: 'US 100' the US top 100 in this study, 'M2011' Mählmann (2011), 'BLM1998' Blume et al. (1998), 'AF2004' Amato & Furfine (2004).**



The sample selection criteria might cause the firms to be too similar with respect to their capital structure, so that other firm specific-factors may help to determine differences in creditworthiness. Macroeconomic factors must be ruled out, as they affect all firms equally.

### 3.2 Methods

It is customary to use an ordered probit model to estimate and predict credit ratings (Blume et al. 1998; Amato & Furfine 2004; Jorion et al. 2009). As mentioned above, the rating scale has specific features that can be best exploited by an ordered probit model, more specifically, an ordered probit panel approach for cross-sectional time series analysis. Altman & Rijken (2004) use an ordered logit model, which does not differ much in application or result<sup>iv</sup>.

#### Ordered Probit

The ordered probit approach regresses the observed discrete rating categories on explanatory variables by an unobserved continuous variable that is assumed to underlie the ratings. Partitioning the range of the unobserved variable then sorts it into the discrete categories. The unobserved variable is a linear function of the observed explanatory variables. We define the unobserved variable as the likelihood of not defaulting.

For the purpose of estimation, we group all AA, A, BBB, BB, B, as well as CCC, CC, and D ratings together, so that we have  $K=7$  rating categories. The ratings of firm  $n$  at the end of year  $t$  is denoted as  $R_{n,t}$  and encoded as 7 for AAA down to 1 for CCC+ and below. Then  $y_{n,t}$  is the unobservable variable 'likelihood of not defaulting' or 'creditworthiness' that underlies the  $R_{n,t}$ , for which  $\mu_k$  for  $k=1, \dots, K-1$  are the partition points independent on  $n$  and  $t$ . The fixed effects panel model for  $y_{n,t}$  is then:

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$$y_{n,t} = \alpha_t + \mathbf{X}_{n,t} \boldsymbol{\beta} + \varepsilon_{n,t},$$

where  $\alpha_t$  is the intercept for year  $t$ ,  $\boldsymbol{\beta}$  is a  $p$  times 1 vector of coefficients,  $\mathbf{X}_{n,t}$  is a 1 times  $p$  vector of the  $n$ 'th firm's specific risk factors in year  $t$ , and  $\varepsilon_{n,t}$  is a Gaussian error term.

The most probable rating category for any observation given  $\mathbf{X}_{n,t}$  is then the estimated:

$$\hat{y}_{n,t}: \Pr(R_{n,t}=k | \theta) = \begin{cases} \Pr(\hat{y}_{n,t} \leq \mu_6 | \theta) & \text{for } k=7 \\ \Pr(\mu_k > \hat{y}_{n,t} \leq \mu_{k-1} | \theta) & \text{for } k=6, \dots, 2 \\ \Pr(\mu_1 > \hat{y}_{n,t} | \theta) & \text{for } k=1. \end{cases}$$

Based on the findings by Jorion et al. (2009) we develop the following hypothesis. If the  $\alpha_t$  show a clearly negative trend over time we cannot reject the claim that CRA are seeking reputational capital, as this is evidence that they are reacting to decreasing quality of accounting standards. On the other hand, if CRA were selling regulatory licenses they would not need to react to this development and the  $\alpha_t$  should remain around zero.

### Unordered Logit

Alternatively, Ederington (1985) suggests an unordered logit to estimate credit ratings. Both methods are able to incorporate the ordinal structure of credit ratings. They differ in the sense that the unordered logit can allow the coefficients of the variables to differ over rating classes, but it disregards the ordered structure of credit ratings. The choice between ordered probit and unordered logit is one between structure and flexibility (Ederington 1985). We can therefore use an unordered logit model to test the stability of the determinants of the coefficients. The results of Ederington (1985) do indeed suggest that coefficients vary over rating classes. Yet, the additional flexibility reduces the predictive power compared to an ordered probit approach.

The unordered logit is mostly constructed like the ordered probit with the exception that a logit estimation assumes a logistic distribution for the error terms  $\varepsilon_{n,t}$ .

## 4. Results

The relationship between firm size and creditworthiness plays a central role in credit rating estimation. We compare the results of our sample with the findings of older studies. Specifically, we compare the effects and significance of independent variables and their stability over rating classes in an unordered logit analysis. We then test the findings of Blume et al. (1998) and Jorion et al. (2009) within our sample.



## Matthies

### 4.1 Firm Size and Credit Quality

Given the properties of our sample presented in Section 3.1 we now perform an ordered probit and unordered logit panel analysis.

#### Test of Significance

The upper part of Table 3 displays the results of two different ordered probit panel regressions (i.e. 'naive' and '5yr') for our subset of US firms<sup>v</sup>. Both models use the variables OI/NS, TD/TA5yr, TA, RE/TA, EBIT/TA, and ROA5yr. The 'naive' model is completed with simple IC, LTD/TA, TD/TA, ROA. In '5yr' we then follow Blume et al. (1998) and allow IC to have a nonlinear effect<sup>vi</sup>. Furthermore, we only include the five year averages of TD/TA and ROA and omit their current values. This approach is similar to other studies that use three year averages (Blume et al. 1998; Amato & Furfine 2004).

In comparison to the results of other studies, both IC and OI/NS have the opposite impact. Moreover, IC has no significant effect even after allowing for nonlinear effects '5yr'. The three measures of leverage (LTD/TA, TD/TA, and TD/TA5yr) have no significant effect if they are all used in a single regression in 'naive'. Yet, when we omit for instance TD/TA and LTD/TA, TD/TA5yr has the expected significant negative effect. The insignificance and varying impact might be caused by multicollinearity within the variables<sup>vii</sup>.

The impact of profitability measures that determine credit ratings depend on the set of estimators used in each regression. The most stable effect is caused by ROA, while other measures like EBIT/TA might even have a negative impact, which is significant at the 10% level. Altman & Rijken (2004) interpret some measures as proxies for past, present, and future profitability. Moreover, agencies might select which measure is most important in their assessment depending on the firm's circumstances. In contrast to Blume et al. (1998), measures of profitability often fail to have a significant impact. As noted in Section 3.1 this might be caused by a small variation of the explanatory variables across rating classes compared to other studies. Firm size measured by TA has a constant significant positive effect independent of further variable selection. In this sample it is also an important measure of the creditworthiness of firms.

We contribute the discrepancy of our results to other studies with regard to some variables being insignificant to our sample selection criteria. This result supports our suggestion to distinguish effects on ratings by firm size and not by ratings themselves. Given the currently understood relationship between firm size and credit ratings, this would probably not change the results of previous studies that distinguish their analysis with ratings. But it might help increase our understanding of that relationship.

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**Table 3: Ordered probit result above and unordered logit results below.**

	Naive			5yr								
	c	t	p	c	t	p						
IC	-0.0566	-0.9791	0.3275									
IC1				-0.0637	-0.8213	0.4115						
IC2				-0.0399	-0.2837	0.7766						
IC3				0.0211	0.1128	0.9102						
OI_NS	-2.2211	-5.1111	0	-2.2591	-5.1746	0						
LTD_TA	0.4006	0.8088	0.4186									
TD_TA	-0.6662	-1.1061	0.2687									
TD_TA5yr	-0.5193	-0.9271	0.3539	-0.8048	-3.1382	0.0017						
TD_TA-TD_TA5yr												
TA	0.2805	8.6251	0	0.2758	8.6506	0						
RE_TA	0.1974	1.3394	0.1804	0.1994	1.3608	0.1736						
EBIT_TA	-1.469	-1.5522	0.1206	-0.0439	-0.0829	0.934						
ROA	1.8281	1.7352	0.0827									
ROA5yr	-0.1588	-0.1553	0.8766	0.0293	0.0295	0.9765						
ROA-ROA5yr												
	CCC to B		B to BB		BB to BBB		BBB to A		A to AA		AA to AAA	
	c	p	c	p	c	p	c	p	c	p	c	p
OI_NS	-12.8299	0.0209	-10.1826	0.0004	-10.2069	0	-9.8713	0	-3.8397	0.0507	-9.3131	0
LTD_TA	-0.3333	0.9555	3.5859	0.3084	5.5244	0.0379	8.1619	0.0004	7.46	0.0008	4.4874	0.0773
TD_TA	-7.2242	0.3563	2.4354	0.5633	-5.8698	0.0639	-9.6921	0.0003	-6.882	0.0076	-5.1386	0.0783
TD_TA5yr	2.6164	0.6953	-6.8704	0.066	2.2258	0.4355	5.8078	0.017	4.3859	0.0632	5.8671	0.0265
TA	1.5901	0.001	0.9735	0	1.3536	0	1.2032	0	0.8198	0	0.8593	0
RE_TA	0.0893	0.9543	3.1275	0.0022	2.4272	0.0081	3.424	0	3.3722	0	2.9333	0.0005
EBIT_TA	-28.5914	0.007	-9.157	0.1026	-14.4826	0.0018	-15.884	0	-16.5548	0	-16.59	0.0001
ROA	32.5919	0.0017	12.998	0.0446	17.4583	0.0013	18.4062	0.0001	18.7548	0	19.8828	0.0001
ROA5yr	13.037	0.3216	1.2359	0.8624	-2.22	0.7061	-7.6235	0.1303	-9.7167	0.0494	-0.4913	0.9266

## Stability over Rating Classes

We next test the assumption that effects over rating classes are constant. For this purpose we analyse the results of an unordered logit panel estimation presented in the lower part of Table 3. Here the K-1 groups of coefficients determining ratings between all rating classes are displayed from between CCC and B to AA and AAA from left to right.

In this model we employ the variables OI/NS, LTD/TA, TD/TA, TD/TA5yr, TA, RE/TA, EBIT/TA, ROA, and ROA5yr. The OI/NS and TA variables have the same stable significant effects as in the ordered probit estimations. In contrast to the probit estimations, LTD/TA and TD/TA have significant effects, although not for lower rating classes. Yet, they have opposite effects, i.e. LTD/TA is positive and TD/TA is negative. In Blume et al. (1998) these effects were the other way around. LTD/TA5yr like LTD/TA has a counter intuitive positive effect. RE/TA and ROA have the expected positive effect, while EBIT/TA has a negative effect.

The results of Ederington (1985) indicate that coefficients might not necessarily be constant over rating classes. Yet, in studies such as Blume et al. (1998) and Jorion et al. (2009), the variables have stable significant effects. In our sample a functional coefficient model might solve the problem posed by the variation of effects across rating classes. Moreover, Blume et al. (1998) show that financial ratios are more informative for larger firms than for smaller ones, and Bhojraj & Sengupta (2003) find that corporate governance characteristics have a larger effect for lower rated firms. These two findings fit neatly together, as larger firms are on average better rated.

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This is compatible with the results in Table 3, where there are fewer significant coefficients for lower rating classes<sup>viii</sup>. Therefore, the factor determining the coefficients of credit rating determinants might be firm size.

The results confirm the findings of Ederington (1985) that effects can vary across rating classes. Furthermore, some coefficients are insignificant or inverse in comparison to other studies. The sample properties of the explanatory variables already suggested this possibility. A reason for this might be sample selection criteria based on firm size. The results highlight the issue of distinguishing effects based on credit quality or on firm size, as suggested in section 2.2.

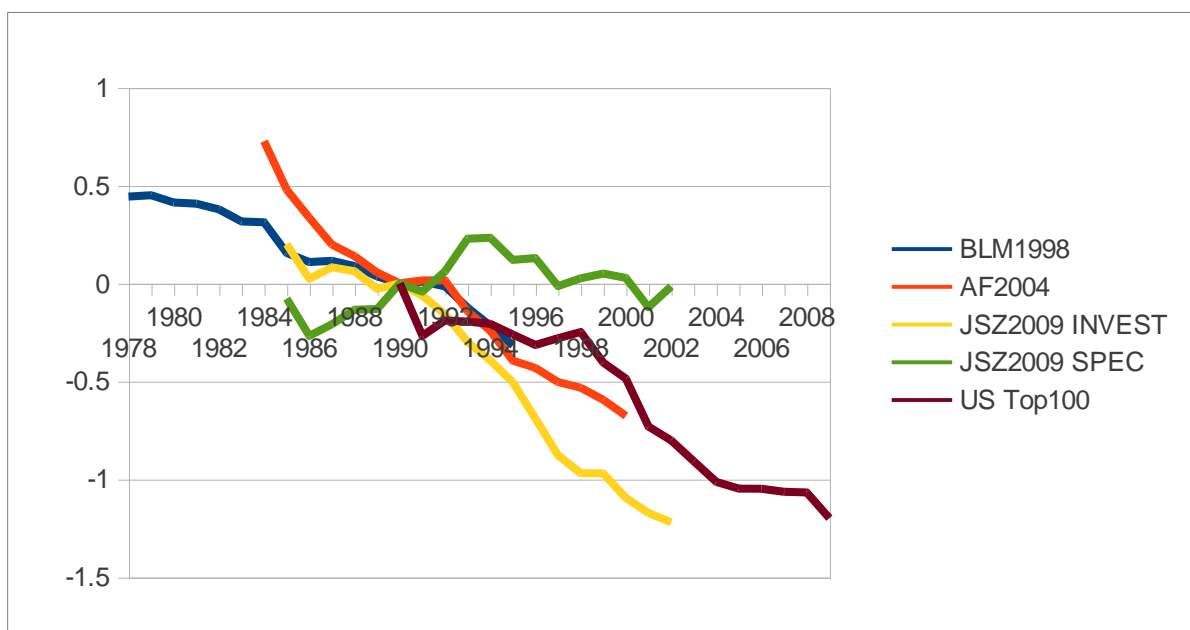
### 4.2 Corporate Ratings and Reputational Capital

The pro-cyclicality of credit ratings is empirically observed, although rating agencies apply a through-the-cycle approach. Therefore, using a measure of the business cycle as a control variable seems appropriate when discussing the results of Blume et al. (1998) who suggest that the decreasing constants of the fixed effects panel model indicate that agencies' standards have become more stringent over time. Jorion et al. (2009) argue that this effect disappears if a firm-specific measure for accounting quality is used. More specifically, accounting quality of investment grade firms seems to have declined over time.

We analyse the evolution of ordered probit panel constants from the 'Naive' model to compare the properties of our sample with the results of Blume et al. (1998) and Jorion et al. (2009).

#### Accounting Quality

**Figure 3: Yearly dummies from the ordered probit fixed effects model from different studies: 'JSZ2009' Jorion et al. (2009); 'INVEST' only investment grade firms and 'SPEC' are the speculative firms, the rest as above.**



## Matthies

The yearly constants of the 'Naive' regression are displayed in Figure 3. The dummies show a negative trend and decrease in time from zero<sup>ix</sup>, set in 1990, and become significantly negative. Figure 3 displays the evolution of the dummy variables of our sample along with the results of Blume et al. (1998), Amato & Furfine (2004), and Jorion et al. (2009). The yearly dummies show a similar trend to those of the other studies.

The sample of Blume et al. (1998) contains only investment grade ratings, while Amato & Furfine (2004) and Jorion et al. (2009) also include speculative ratings. Moreover, Jorion et al. (2009) perform two distinct estimations for investment and speculative ratings. Our yearly constants behave similarly to the investment grade estimation of Jorion et al. (2009). This result can be expected, as our sample contains more investment grade ratings when compared to Amato & Furfine (2004). Notably, Blume et al. (1998) interpreted the negative trend in the yearly dummies as evidence that agencies' standards have become more stringent. They show that the coefficients of the explanatory variables are stable over time<sup>x</sup>. They therefore argue that the negative trend is evidence that agencies have become more critical in assessing the creditworthiness of firms. Amato & Furfine (2004) show that these results are robust with respect to the inclusion of measures of the business cycle. Blume et al. (1998) dismiss the critique that the trend might indicate the development of factors which were omitted from their study by arguing that the literature did not suggest further important determinants of credit ratings at the time. Since then Bhojraj & Sengupta (2003) as well as Ashbaugh-Skaife et al. (2006) have shown that credit ratings are also dependent on corporate governance characteristics. Nevertheless, neither study addresses a possible impact of corporate governance mechanisms on rating stability.

Jorion et al. (2009) provide an alternative interpretation to the negative trend. Rating agencies are dependent on the information provided by the firms themselves, as the agencies do not themselves collect data, and their assessment is critically reliant on the quality of the firm's accounting data (Hill 2004). Jorion et al. (2009) first show that the negative trend is restricted to investment grade ratings (see Figure 3). Furthermore, after including a measure of firm specific accounting quality, the negative trend disappears. They therefore attribute the observed decline to changes in accounting quality.

The findings presented here do not definitely resolve the issue of reputational capital, but are an empirical indicator of the role rating agencies play on corporate bond markets. The decline of accounting quality caused by increasing options for earnings management would have given agencies the opportunity to inflate ratings and thereby please issuers. So if rating agencies had been selling regulatory licenses they need not have increased their stringency, which they did. Therefore, due to the decline of  $\alpha_t$ 's we cannot reject the hypothesis that rating agencies are seeking reputational capital. Yet, this does not mean that the behaviour of CRA is not improvable. The findings by Mählmann (2011), that longer relationships between firms and CRA improve ratings, point to the limits of reputational capital.

## 5. Conclusions

The literature review focuses on the analysis of empirical evidence for reputational capital on three individual rating markets, including an individual market analysis to determine whether rating agencies sought reputational capital or tried to sell regulatory licenses. The literature is reviewed with regard to the relationship between firm size and corporate credit ratings. We conclude that the relationship between firm size and credit quality is not yet fully understood. Moreover firm size as an independent variable should be used to distinguish between effects on credit ratings rather than the dependent variable credit quality itself. In contrast, the empirical evidence supports the view that rating agencies sold regulatory licenses on the market for structured finance products prior to the 2008 financial crisis.

In order to test the international relevance of ratings a survey of corporations rated by S&P is conducted. The result is that the number of ratings decreases outside the USA. Internationally the number of ratings has increased since the year 2000.

We perform a probit panel analysis on a subset of US-firms to test effects over firm size and confirm the results of Blume et al. (1998) and Jorion et al. (2009). We interpret their results as implying that rating agencies react to declining accounting quality. This can be interpreted as evidence that rating agencies are seeking reputational capital on corporate bond markets. This is a new approach to investigate the issue of regulatory licences and reputational capital. We find the results of the market analysis and empirical results imply that rating agencies try to gain reputational capital on the corporate and sovereign bond markets.

## Acknowledgement

This research was supported by the Deutsche Forschungsgemeinschaft through the SFB 649 'Economic Risk' and a stipend of Förderung des wissenschaftlichen und künstlerischen Nachwuchses des Landes Schleswig-Holstein. I am grateful for useful comments from attendees of the 2012 Annual Paris Business and Social Science Research Conference and an anonymous reviewer.

## Endnotes

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- <sup>i</sup> This argument again touches on the issue of market efficiency.
  - <sup>ii</sup> For similar reasons Altman & Rijken (2004) use firm age as a determinant.
  - <sup>iii</sup> Firm size measured by total assets is deflated using a CPI taken from the US Department of Labour from 2011.04.15 downloaded 2011.04.28: <ftp://ftp.bls.gov/pub/special.request/cpi/cpiat.txt>. Then the natural logarithm is taken.
  - <sup>iv</sup> See Ederington (1985) for a more detailed discussion. The logit and probit method differ in the error distribution. The probit approach assumes a Gaussian distribution while the logit models assumes a logistic distribution.
  - <sup>v</sup> Only the coefficients of the variables are shown. The yearly constants are discussed in detail in Section 4.1 below.
  - <sup>vi</sup> In contrast to Blume et al. (1998) we only partition IC into three variables, as there are no IC>20. For more details see Blume et al. (1998).
  - <sup>vii</sup> Amato & Furfine (2004) suggest this to explain the non-significant effect of TD/TA in their study.
  - <sup>viii</sup> There are also fewer observations in these rating classes, which might cause this result.

<sup>ix</sup> Each study sets the first year dummy to zero.

<sup>x</sup> This is tested using a random effects model. The main results stem from a fixed effects model.

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