

New Tendencies in Rating SMEs with Respect to Basel II

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Abstract. So far rather weak tendencies towards an infrastructure for external ratings by independent agencies have been observed in Europe in recent decades. Especially for small and medium-sized enterprises (SMEs), thus far there has been no possibility of obtaining an objective rating. The reason is that information is very asymmetric between investors and capital demands on small and medium-sized companies. But due to the new capital accord by the Basel Committee on Banking Supervision the situation will change. Our paper shows that having Basel II in mind there is need for rating also medium-sized companies. We will also give an overview of characteristics that have to be incorporated in such ratings and further describe models, products and companies in this sector. Especially so-called soft computing methods like Fuzzy Logic or Neural Networks are very promising approaches in the field of rating SMEs.

Key words: credit risk, Basel II, SMEs, rating, soft computing methods.

1. Introduction

1.1. *Changes in Rating Culture in Germany*

Compared to the situation in the United States rather weak tendencies towards an infrastructure for external ratings by independent agencies have been observed in Germany in the last decades. So, according to a study, published by the IWK, Munich¹, in January 2000 only 170 German enterprises and banks exhibited a rating by an international agency while in the USA about 8000 companies had a rating. Certainly, German banks do internal ratings to decide about whether a company fulfills the requirements to get a credit, but their outcome is not published and often influenced by subjective goals of the respective bank. “Even the firm being rated is typically not informed about its current internal rating”. In contrast to those, external ratings usually are created explicitly in order to publish them and to give a neutral and objective evaluation of a company’s credit status and additionally should give an outlook on its future potential and chances on the market.

¹Becker, 2000

There are various reasons for this exceptional difference in the amount of rated companies. One cause can be identified in the typical German house bank system: the bank plays the role of an intermediary between investors and credit demand and gives bank credits to its customers to conditions, which are determined by their internal rating. In the Anglo-Saxon bank system, investment banks are not allowed to issue bonds themselves and, therefore, deal with loans thrown on the market by companies which have a demand for debt financing. This private issuing makes it necessary for those companies to prove their general ability to pay to the public, which can be achieved by a rating created by an acknowledged agency.

Another reason is that the demand for industrial loans is much smaller in Germany, because of the broad supply of government bonds and the investors' rather risk averse attitude. These facts lead to a totally different debt structure in Germany compared to the USA. In Germany nearly half of the debt market is covered by bank credits, in the USA about 80 percent of the market volume for debt are corporate loans.

Recent developments on the international capital markets in the EU obviously are leading to a change of this structure. The "new framework for banks' capital adequacy (proposed by) ... the Basle committee on banking supervision (at July, 3, 1999), intends to reward their portfolios on their aggregate credit rating". So, banks are induced to evaluate their credit risk by a standardized rating or use external ratings by External Credit Assessment Institutions (ECAI), to categorize it and to back it with equity corresponding to its risk classification. According to the latest Consultative Document (January 2001) of the Basle Committee the capital requirements for the banks may be higher for loans and credits given to unrated companies than for those with a rating better than A-. This is due to the higher risk weight assigned to unrated corporations entering the capital requirement calculation. This makes it inevitable, for companies with a strong demand for capital to acceptable conditions to get rated, as otherwise banks don't have a clue about the company's standing and may give them bad credit conditions. These facts indicate that industry loans as well as ratings are gaining importance on the European capital markets.

This trend, however, causes problems especially for middle-class enterprises, as information is very asymmetric between investors and capital demanding small and medium-sized companies. A rating, which would remove this asymmetry, is not offered by the traditional rating agencies as Standard & Poors, Moody's or Fitch IBCA for this category of firms. For smaller companies both non-rated and not listed on the stock market the so-far most commonly used models for credit risk management couldn't be applied anyway. Neither the structural approach by Merton and its refinements – e.g., by KMV – nor the reduced form approaches using the rating of a company as an input variable can be used for medium-sized companies since they are not listed on the stock market and do not have a rating.

We will show that, especially for middle-class enterprises, thus far it was difficult to obtain an objective rating by the major rating companies. Furthermore, it even might not meet their requirements, because these agencies are specialized mainly on rating bonds and loans, while middle-class companies often are in need of equity capital. Bigger, rated companies, e.g., such listed at the Frankfurt Stock Exchange, saturate their demand for

equity on the stock market and naturally spread more information about the firm's projects and its credit status, which leads to lower capital costs for them, if their prospects are good. On the other hand, medium-sized companies which are not as well-known get worse conditions even if their ability to pay and projects promise prosper future developments, just because of a lack of information on the capital markets. Recognizing this "niche for an agency rating medium-sized companies" several rating agencies for this market sector were established in Germany since 1998. These were the first activities towards a supply of rating products for medium-sized companies in the world.

1.2. *Objective of the Paper*

This work shall explain why with respect to Basel II there is need for a rating for medium-sized companies and describe the problems one might face applying the traditional approached to evaluating Credit Risk. We will further give a brief overview of already existing companies and products in this sector and come up with necessary future steps which have to be taken. The next chapter shows the consequences of the new Basel Capital Accord (Basel II) and the importance of ratings both in the standardized and the so-called internal rating based (IRB) approach of the accord. In the third chapter we will then introduce some of the new rating agencies, give information about their target groups and methods. We will also point out which functions a rating for middle-class enterprises has to fulfill and, furthermore, show the advantages of such a rating and an exemplary rating process. In the fourth chapter we will then give an overview about soft computational methods that could probably be useful for a rating process and how they might be incorporated in the rating procedure. The paper ends with a short conclusion of its contents and results.

2. **Basle II and the Importance of Ratings**

2.1. *The New Capital Accord*

Due to the New Basel Capital Accord (Basel II) until 2004 every European Bank is obliged to provide approaches in their credit risk management "which are more comprehensive and sensitive to risks"². The new framework – a revision of the 1988 Basel Accord – is due to the problems arising from evaluating new complex instruments in the credit sector and a change in the optimistic view on Credit Risk Modeling as a result of, e.g., the Asian Crisis. The capital adequacy can be measured by different methods including external and internal ratings.

The new framework requests banks to evaluate their credit risk based on a standardized rating. The rating can be obtained from the bank itself (Internal Rating Based Approach) or in the so-called Standardized Approach the bank may use external ratings

²Basel Committee on Banking Supervision (2001): Consultative Document – The Standardized Approach to Credit Risk

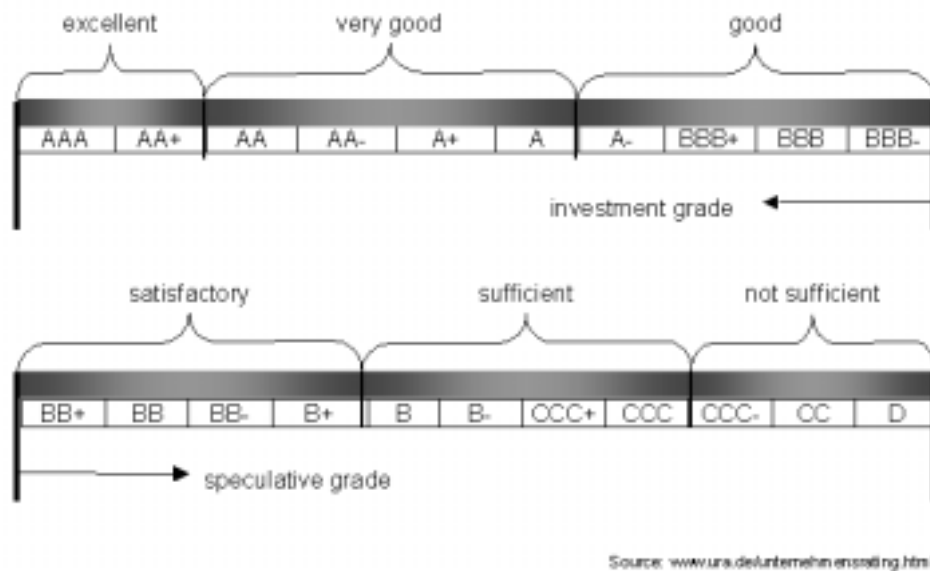


Fig. 1. A typical Rating Scale (by URA) – adapted from Moody's Scale.

done by External Credit Assessment Institutions (ECAI). Fig. 1 shows an exemplary rating scale as it is provided by Unternehmens Rating AG (URA). The scale was adapted from Moody's – one of the biggest rating companies in the world.

The idea behind using ratings to evaluate credit risk is simply that companies in a certain rating category will have approximately the same default probability. It is also assumed that the default probability in the future will be the same as the historical default probabilities for that category. Table 1 shows the average cumulative default rates by letter rating from 1 to 10 years.

Table 1
Average cumulative default rates by letter rating from 1 to 10 years (Source: Moody's Investors Service)

Rating	1	2	3	4	5	6	7	8	9	10
Aaa	0.00%	0.00%	0.02%	0.09%	0.20%	0.31%	0.43%	0.62%	0.83%	1.09%
A	0.08%	0.25%	0.41%	0.61%	0.97%	1.37%	1.81%	2.26%	2.67%	3.10%
A	0.08%	0.27%	0.60%	0.97%	1.37%	1.78%	2.23%	2.63%	3.10%	3.61%
Baa	0.3%	0.94%	1.73%	2.62%	3.51%	4.45%	5.34%	6.21%	7.12%	7.92%
Ba	1.43%	3.45%	5.57%	7.80%	10.04%	12.09%	13.90%	15.73%	17.31%	19.05%
B	4.48%	9.16%	13.73%	17.56%	20.89%	23.68%	26.19%	28.32%	30.22%	31.90%
Investment-Grade	0.16%	0.49%	0.93%	1.43%	1.97%	2.54%	3.12%	3.68%	4.27%	4.85%
Speculative-Grade	3.35%	6.76%	9.98%	12.89%	15.57%	17.91%	19.96%	21.89%	23.59%	25.31%
All Corporates	1.33%	2.76%	4.14%	5.44%	6.65%	7.76%	8.77%	9.71%	10.61%	11.49%

Table 2
Risk weights for corporates according to Basel II

Rating	AAA to AA–	A+ to A–	BBB+ to BB–	below BB–	without
Old Accord	100%	100%	100%	100%	100%
New Accord	20%	50%	100%	150%	100%

2.2. Ratings in the Standardized Approach

According to the Standardized Approach of Basel II banks are obliged to categorize the risk and to back it with equity corresponding to its risk classification. Table 2 shows that according to the latest Consultative Document (January 2001) of the Basle Committee the capital requirements for the banks will be higher for loans credits given to unrated companies than for companies with a rating better than A–. This is due to the higher risk weight assigned to unrated corporations entering the capital requirement calculation. However it will be lower for unrated companies than for companies rated with B– or worse.

The new accord requires internationally active banks to hold capital equal to at least 8% times the assigned risk weight of the claims amount. This means, e.g., that for a credit given to a company rated A+ (B+) a bank will have to hold capital equal to at least $8\% \cdot 50\% = 4\%$ (or $8\% \cdot 150\% = 12\%$, respectively for a B+ rated company) of the value of the claim. So far, all claims on the non-bank private sector received the standard 8% capital requirement. Therefore a good or bad rating of the obligor in the future will decisively affect the capital to be held by the banks.

2.3. Ratings in the Internal Rating Based Approach

In the more complicated internal rating based approach (IRB) the calculation of total risk weighted assets (RWA) for corporate claims is a two-step process.

Step 1. The bank computes a baseline level of RWA for the non-retail portfolio which is calculated by summing the individual exposures multiplied by their respective IRB risk weights. The risk weights which depend on each instruments probability of default (PD) and loss-given default (LGD), and, where applicable, maturity M.

Step 2. The banks total RWA for the non-retail portfolio is calculated by adding to this baseline level an adjustment, which may be positive or negative. The level of adjustment should reflect the granularity (i.e., the degree of single-borrower risk concentrations) within the portfolio. The effect of this adjustment is to reduce or increase the total RWA of portfolios having relatively large (small) single-borrowers risk concentrations.

If there is no explicit maturity dimension, the corporate exposure will receive a risk weight (RW_c) that depends only on PD and LGD, while the average maturity is assumed to be three years.

The corporate risk weight then is calculated using the formula

$$RW_c = \min \left(\frac{LGD}{50} \cdot BRW_c(PD); 12.5 \cdot LGD \right).$$

Table 3 shows for certain probabilities of default how the benchmark risk weights (BRW_c) for a company are assigned according to the corresponding PDs:

For exposures with an effective maturity different from 3 years, an asset's maturity-adjusted risk weight is calculated according to the formula:

$$RW_c = \min \left(\frac{LGD}{50} \cdot BRW_c(PD) \cdot (1 + b(PD) \cdot (M - 3)); 12.5 \cdot LGD \right).$$

Again $BRW_c(PD)$ is the corporate benchmark risk weight associated with PD and the term $(1 + b(PD) \cdot (M - 3))$ is a multiplicative scaling factor, linear in M , and the maturity adjustment factor $b(PD)$ is also a function of PD .

To obtain the functional dependence behind the relationship of BRW and PD , the Basle committee exhibited a pooled survey and investigated model-based evidence. They finally came to describe the relationship between BRW and PD the following way:

$$BRW(PD) = 976.5 \cdot \Phi(1.118 \cdot \Phi^{-1}(PD) + 1.288) \cdot \left(1 + 0.470 \cdot \frac{1 - PD}{PD^{0.44}} \right).$$

Obviously the above expression consists of three separate factors:

- $\Phi(1.118 \cdot \Phi^{-1}(PD) + 1.288)$ represents the sum of expected and unexpected losses. This is associated with a hypothetical, infinitely-granular portfolio of one-year loan having an LGD of 100%. Here was used a Merton-style credit risk model with a single systematic risk factor. The values of borrowers assets are lognormally distributed.³

Table 3
Probability of Default (PD) and assigned Benchmark Risk Weights (BRW)

$PD\%$	BRW_c	$PD\%$	BRW_c
0.03	14	1	125
0.05	19	2	192
0.1	29	3	246
0.2	45	5	331
0.4	70	10	482
0.5	81	15	588
0.7	100	20	625

³The Basle committee states that "This class of models includes special cases of two industry-standard credit risk models, *CreditMetrics*TM and *PortfolioManager*TM, and provides a reasonable approximation to a third, *CreditRisk*TM."

The coefficients within this expression then are calibrated to an assumed loss coverage target of 99.5% and an average asset correlation of 0.20. The asset correlation figure 0.20 is – according to the Basle II – broadly consistent with industry practice and research carried out by the Committee. This is a hypothetical loss coverage target used for calibrating minimum capital requirements for credit losses only. It does not represent the Committees view of expected or optimal default rates for banking organisations.

- The term $(1 + 0.470 \cdot \frac{1-PD}{PD^{0.44}})$ is an adjustment, since the IRB benchmark risk weights are calibrated to a 3-year average maturity.
- The scaling factor 976.5 is calibrated in a way that the BRW equals 100% for values of $PD = 0.7\%$ and $LGS = 50\%$.

According to Basel II to determine the probability of defaults for the companies it will be necessary to have an internal rating process or to use ratings by external credit assessment institutions. Therefore, the process of calculating the risk weights is different but it remains the importance of obtaining a rating also for small and medium-sized companies.

2.4. Consequences of the New Capital Accord

As a consequence of both the importance of a rating and determining a corresponding probability of default, especially smaller banks dealing with medium sized companies will have to revise their rating system and may be forced to provide higher capital requirements to meet the obligations. The problem is not only that many smaller banks so far didn't have an adequate internal rating system but that at the current state of discussion the revised accord may even not allow for the most commonly used models like KMV or S&P's CreditMetrics. For smaller companies both non-rated and not listed on the stock market the so-far most commonly used models will be difficult to apply⁴. Neither the structural approach by Merton and its refinements – e.g., by KMV – nor the reduced form approaches using the rating of a company as an input variable can be used for medium-sized companies since they are not listed on the stock market and do not have a rating. The consequence is that the banks will either have to implement a new internal rating system to obtain ratings also for medium sized companies or – especially when they will be using using the standardized approach – get these ratings from ECAI (External Credit Assessment Institutions). Also for companies with demand for capital to acceptable conditions, it is important to get rated, as otherwise banks due to higher capital requirements give them bad credit conditions. Since not all banks will have an appropriate rating systems or the companies may not be satisfied with their rating given by the housebank there will be more and more need for independent external ratings from ECAIs.

⁴See for further explanation (Link, Rachev, Trueck, 2001)

3. The Rating Process – Requirements and Structure

In the last two chapters we showed that both for medium sized companies and for banks trying to model the default risk of such companies there is need for appropriate ratings. In this chapter we will come up with functional requirements of such ratings.

3.1. *Functional Requirements*

A rating product targeting small and medium-sized companies (SMEs) as customers has to fulfill different functions than the traditional products do. The big international agencies on the sector of industrial enterprises so far restrict themselves mostly to the evaluation of exactly defined loans. Certainly, this rating also takes into consideration the firm's overall credit status, but usually the company itself is not the object of the rating and the future outlook and ongoing projects are not noticed by it. SMEs are not in the situation in which they can easily acquire equity, but on the other hand they are in need of capital to finance investments to enlarge their business to a bigger extent than big firms are. Therefore, qualitative aspects regarding the company's future developments should be considered in order to draw conclusions on the firm's ability to pay and to find the correct rating. Additionally, to improve the enterprise's chances on the equity market not only the credit standing should be evaluated, but also a chance and risk contemplation should influence the result of the rating.

As German entrepreneurs proverbially are frightened of imparting intimate information about their company, ratings do not enjoy a big acceptance among medium-sized companies. In order to make leaders of small and medium-sized companies understand that it is necessary to remove the informational asymmetry between them and the capital markets, incentives to use this chance to acquire capital have to be created.

One aspect is to demand a for the target group bearable price. The big agencies take a relatively high price, which is eventually not affordable for smaller companies or at least they estimate the benefit lower than the costs. Therefore the new established rating agencies URA Unternehmens Ratingagentur AG, R@S Rating Services AG and Euro-Ratings AG decided on lower entry prices (see Fig. 2). Another aspect is an agency's independence of a bank's capital market strategy. As mentioned above, results of internal ratings by banks are often object to the bank's intention and, therefore, not useful for an objective judgement about a firm's actual situation. In addition, if an enterprise intends to get a bank credit and is rated by the bank's own agency, it might hold back negative information in order to get better credit conditions. Those factors decrease the rating's quality.

On the other hand, results of private rating agencies have to be comparable and as a consequence should agree on using the same scale and – if not the same standardized methodology, so at least systems with high conformity. Furthermore, to achieve the market's acceptance the continuity of the rating system and the permanence and good reputation of the agencies have to be guaranteed. Without these requirements, a company cannot be sure if a rating will be still valid in the future so that it is not willing to spend

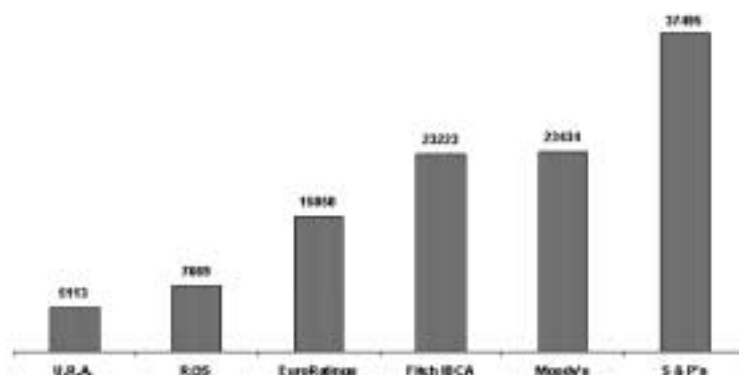


Fig. 2. Entry prices for ratings in Euro (Date 01/2000).

money on it. An important influence on the latter criteria for a successful introduction of a SME rating is the equality of the evaluation target. If one agency sets the center of gravity on the shareholder value, another one focusses on the value of the debt and again another one aims on the future outlook, despite congruent rating scales there is no sense in a comparison of the results. So there is a demand for transparency of the methodology of the rating products.

In Germany a friendly society, RatingCert e.V., tries to cope with that task and wants to develop common quality standards for a rating of medium-sized enterprises and make them public around Europe. RatingCert e.V. sees its main proposition in identifying and securing minimal requirements to credit agencies in Europe without hindering the competition among them.

A further important point is sufficient qualification of an agency's analysts. In order to evaluate the future prospects and current position on a certain market, the employee of a rating agency must at least have insights into the current technical status quo of the respective branch. Especially smaller companies, as, e.g., component suppliers for bigger firms, compete on markets, where high technical knowledge is necessary to differentiate the products of the manufacturers. So, to give a proper and realistic valuation of a firm's standing on its market, in addition to economically educated analysts, there is a need for specialists having a more technical background of the different industry branches in a rating agency. This requirement seems to be quite difficult to achieve, as the SME segment is very inhomogeneous and a very broad range of specialists for lots of different fields is needed. Thus, we will have a brief look at the Eligibility Criteria for an ECAI according to Basel II. There are six criteria mentioned.

- **Objectivity:** "The methodology for assigning credit assessments must be rigorous, systematic, and subject to some form of validation based on historical experience".
- **Independence:** An ECAI has to be independent, the assessment process should be as free as possible and there should be no political or economic pressure.
- **International access/Transparency:** Since the assessment should be available also to foreign institutions, the rating and the methodology should be published in an

international accessible form.

- Disclosure: “An ECAI should disclose qualitative and quantitative information about their rating methodology and information as set forth below” to avoid a so-called “assessment shopping” for institutions which give more favourable ratings.
- Resources: The ECAI should have sufficient resources to carry out appropriate credit assessments.
- Credibility: This criterion is very important to prevent the misuse of confidential information. In order to be eligible for recognition, according to Basel II, an ECAI does not have to assess firms in more than one country.

3.2. *An Exemplary Rating Process*

Although it was stated above that the rating procedure of the traditional agencies has to be adapted to the requirements of middle-class enterprises, the rough structure will be similar. The process starts with a company’s request of a rating being handed in to the respective agency. In a first meeting the enterprise is informed about which information is needed to generate the rating. While the company is collecting this information, the agency appoints a team of analysts. First, by taking into account the history as well as the social, political and legal situation in the country the enterprise is located at, the so-called country risk is determined. The next step is the analysis of branch specific characteristics and competitive analysis. This “industry outlook” is evaluated by contemplation of indicators like market growth, profitability, market concentration, dependency of the level of economic activity, eventual barriers to entry or technological changes. Then the company’s market position is determined and a quantitative analysis, including a contemplation of key figures as the return on investment or the capital ratio, as well as a qualitative analysis, taking into account organizational factors like business management, future strategies or financial flexibility, follow.

By an aggregation procedure, a result is extracted and passed to the rating committee consisting of a heterogeneous group of experienced analysts. This rating committee discusses the outcome of the rating and decides whether there are any tasks to be redone or the rating can be accepted. If it is not content with the results, the quantitative and qualitative analysis is repeated. Usually country and branch risk is not calculated for every single rating, but regularly and then dropped into the rating.

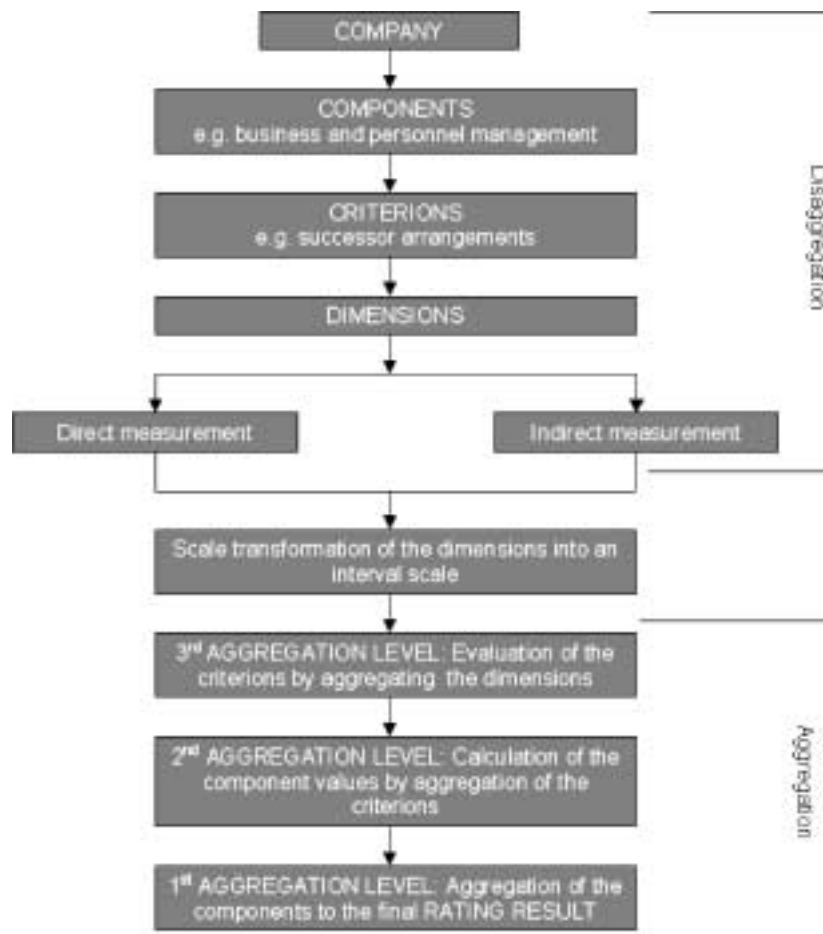
The by the committee acknowledged rating is then passed on to the requesting company which again has the possibility to accept it or not. If not, new meetings are scheduled in which the business management can hand in new or additional internal information, resulting in a qualitative reanalysis. Finally, having accepted the rating, the company now can opt if the rating is published or not. Eventually, the company is observed over a period of time after the first rating and, if necessary, an upgrade or a downgrade may be executed.

3.3. *The Selection and Aggregation of Criteria*

A crucial point, where a middle-class rating has to differ from the traditional ratings for large-scale enterprises, is the choice of criteria which are investigated and the weights,

they are awarded with. Obviously, there are different aspects which influence the status of a medium-sized company more or less than criteria one would concentrate on, when rating a larger firm; e.g., as a matter of fact and as a consequence of the rather bad standing middle-class companies have on the equity market (compared to stock-joint companies), they have a much smaller capital ratio. So, a comparison between a larger and a medium-sized company by measuring the capital ratio with the same weight might be somewhat unfair. So, a specific weighting system has to be developed by middle-class rating agencies.

But this is only one point. The other and even more important change, which has to be made, compared to traditional rating schemes, is that the selection of criteria itself, which serve as the basis of the rating, has to be adapted. It is self-evident, that there



Source Wagner 1990, p. 154.

Fig. 3. Components, criteria and aggregation in a rating process.

are specific aspects which are typical for medium-sized companies and not observable in large-scale enterprises and vice versa. An example: In a private owned middle-class company the entrepreneur has to cope with the problem of appointing an adequate successor or substitute, when he plans to back out or is temporarily indisposed. Such an event might lead to a totally different business strategy, but does not occur in that form in a stock-joint company, which typically is a larger enterprise. Firms listed on the stock market are monitored by their supervisory boards guaranteeing a certain grade of strategic persistence. So, the eventual contractual successor and substitute arrangements must be taken into account.

On the other hand, a medium-sized firm might have, e.g., a less elaborated budgeting system, resulting in some key indicators not being available. Differing from traditional rating systems, which are capital-market-oriented, a SME rating should evaluate a well-balanced mixture of past as well as future-oriented aspects, seeking for a rating system, which should be more stakeholder-focussed. This often is a problem which has to be solved separately for every rating request, but with the goal of standardizing the process as far as possible, it stays an issue. A formal conception of a system of criteria and their aggregation to a final rating result was developed by Wagner (1990) (see Fig. 3). He calls certain aspects, such as finance and accounting or business and personnel management, components, each of which forms an integral part of the rating. This system of components is individually filled with criteria for each rating process, depending on the type of company and the provided information. These criteria are assigned to the respective component. Taking into consideration possible autocorrelations, a quite sophisticated aggregation concept and a linear regression model then is applied to obtain an adequate rating.

3.4. Ratings in Practice

However, it seems that so far in practice most methods rather work with more qualitative than quantitative analysis and rather simple methods to obtain a rating. Table 4, for example, shows the fields (corresponding to the components in Wagner's terminology), URA investigates and calculates values for, by using its own "analysis tool". Those fields are measured by investigating sub-criteria, which in the case of field two "human re-

Table 4
Considered factors and their weights in an exemplary rating procedure

Factor	Weight
Management and organization	0.2
Human resources	0.15
Corporate finance	0.4
Products and markets	0.15
Production- and Information-technology	0.05
Facility location(s) and ecology	0.05

sources” – as an example – are “personnel planning”, “workforce” and “human resources development and policy”.

Despite there seems to be quite a good balance between the purely capital-market- and past-oriented field “corporate finance”, and the other at least partially qualitative and future-oriented components, the rating methodology has still space for improvements. Also the question rises whether there is not a high degree of arbitrary in the evaluation and rating results. For refinements it is necessary also to include more statistical and mathematical methods like:

- Multiple Regression Models;
- Factor Analysis;
- Correspondence Analysis;
- Discriminant Analysis.

In many rating processes some of these methods are already incorporated. But to use such more quantitative techniques there is need of reliable numbers from the companies and also historical data. As long as medium sized companies provide rather sparse data it will be very difficult to use these methods adequately for rating procedures. However, there are some rather new soft computing methods that may provide very good results since they may better integrate the so-called soft factors. Methods like Neural Networks, Fuzzy Logic or Expert Systems or hybrid models using several of these techniques at once will be described in the next section.

4. Soft Computing Methods

The idea behind using those methods in a rating system, is to better integrate so-called soft factors, which we so far referred to as qualitative factors, into the rating concept. By using such soft-computing methods, different advantageous characteristics are feasible, such as flexibility and a standardized process same time, plus “comprehensibility of all system-related decisions”. The new soft computing methods, that shall be investigated here, are neural networks and fuzzy-logic systems.

4.1. Neural Networks

The advantage of scoring systems, that traditionally are used in rating procedures, is that they are based on comparatively simple statistical methods, e.g., as Wagner’s dimension-correlation-matrix. However, a rather high price has to be paid for this positive feature: it suffers from a lack of flexibility. Is a remarkable low validity recognized, it is necessary to change the process or part of it. Finding the source of the stated invalidity, however, is very time-consuming and difficult to convey. Neural networks do not have this disadvantage. They easily can be re-calibrated “by retraining them”. This means for instance, that the logistic regression, which is employed as the reference model in the case of insolvency prognosis, is redone with a set of data representing the new situation and is often referred to as a neural network’s “learning capability”. On the other hand the difficulty lies in

developing the fitting network architecture for the rating process, while an advantage of the neural network technique is, that any non-linear connections between variables can be simulated by them. An exemplary procedure of developing a neural network shall be described in the following. Using a parametrical model – in case of the insolvency prognosis tool, the already mentioned logistical model – the first step is the regression with the different criterions as describing variables. If a statistical test shows, that a variable is insignificant for the regression, it is crossed out of the list of variables. Then the system is checked for any achievable increases in significance by implementing so-called hidden neurons, which are able to introduce non-linear correlations between variables. This is proceeded until they are no more improvements feasible. The outcome of the insolvency prognosis model, described by Anders (1997), is that six significant variables influence a firm's (in)solvency, of which the characteristics turnover level, limited liability have a linear influence, while the age of the company, the quality of the company as a commercial firm and the entrepreneur's educational achievement have a non-linear connection with a firm's insolvency. A company's membership in the manufacturing industry has both, a linear and a non-linear influence. As a practical example for a rating method on the basis of such a network technique, the Baetge-Bilanz -Rating, introduced to the market in 1995, has to be mentioned. It uses the so-called BP14-system, which investigates 14 key indicators by a neural network, which was derived from a survey of more than 12 thousand annual financial statements. In the beginning of 2000, the Baetge & Partner GmbH and the "Verband der Vereinten Creditreform" founded the Projekt Status GmbH, which concentrates on SMEs and adds information about the probability of default in the respective branch and additional economical data to the result of BP14.

4.2. Fuzzy Logic

While "the main backdraft for Neural Networks ... is their inability to give a precise explanation for a computed result", fuzzy logic systems comprise transparency of the path leading to the calculated result. An integral part are fixed membership functions, which state, how similar the object of the calculation is to an ideal image of it. The functions can have quantitative as well as qualitative input factors, which can be won by surveys about the investigated candidate and do not need any regression results. This makes the evaluation independent from past data, but it relies on the opinion and evaluation of experts. In technical applications fuzzy logic systems are used to process "qualitative knowledge" and extract decisions from it by separating the logic of the decision from the "fuzziness" of the input information. This is a well applicable feature in the case of a rating system. The output is a set of results of membership functions, which usually have values between zero and one and give information about the quality of the membership of an object to a certain domain. This corresponds to taking dimensions (in Wagner's terminology) measured in standardized scales, whose values are the outcome of inquiries, and processing them to criterion values, or respectively processing them to the quality of a component. Thereby, the results show how close the investigated company comes to an ideal, which first has to be defined by the estimating institution. By employing back-testing methods, the validity of those definitions and the membership functions, and, therefore, of the

whole system has to be proven. Changes of the membership functions, the image of the ideal quality of the object, or simply a change of the advising experts are necessary, if this is not possible. As no efforts like recalibrating the system by intensive database research have to be undergone if any deviations from reality are observed, the system comprises an even higher flexibility than neural networks.

4.3. *Hybrid Systems*

After discussing the pro and cons of the diverse soft-computing methods, developing “an integrated realization methodology that uses (their) individual advantages” suggests itself. The Basle framework for banks’ capital adequacy triggered the development of an “intelligent rating approach”, which is able to simulate a human decision process, by the Zurich company RCS Riskmanagement Concepts Systems AG, in May 1996. A performance analysis of the system with real market data, conveyed in 1999, showed that utterly good results are achievable by the system: In the two highest rating categories no defaults were observed, while in the lowest class the default rate was at 25 percent.

5. Conclusion

In the last sections we explained the need of ratings to incorporate Basel II into risk management systems. We also showed that the repeatedly mentioned rating culture is currently developing and new soft computing methods may provide techniques that will also be able to deal with rather qualitative data provided by SMEs. On October, 14, 1999 ELSA, an internet access provider and supplier for computer graphic solutions, listed on the German Neuer Markt, published their BBB+ rating, which was furnished by URA. When ELSA published their year-end results, they confirmed the positive rating. This example could eventually be a first break through concerning the establishment of an investor-related as well as an enterprise-oriented rating market.

However, what still is missing is the general acceptance on both sides, as a survey in Becker’s IWK-Studie 01/2000 shows. This, however, is only natural as the market does not have evidence that the applied rating procedures are valid, and their results correspond to reality, but with several examples like ELSA this problem should be solvable.

We further showed that despite an important orientation on the classical rating system for large companies (e.g., done by S&P, Moody’s, KMV etc.), the models for estimating default probabilities have to be adjusted. Especially due to probably higher volatility of a medium sized companies assets and the lack of data for default rates and transition matrices – the classical structural and reduced form models cannot be applied yet. Also there is no information about historical default rates for companies with various ratings, so still we do not know enough about the goodness of ratings for medium sized companies in general nor for certain rating companies, respectively. Also the question rises whether there is not a high degree of possible arbitrary in the evaluation and rating results. Especially mapping qualitative to quantitative data is always a source of arbitrary and it has to be investigated how to deal best with this problem.

We also described the need for more technical methods, like neural networks and fuzzy logic techniques, in order to create general accepted standardized tools, whose validity can be proven. It is not enough, to just come to a rating result by a discussion on a round table of experts, to convince entrepreneurs and investors of the reliability of the rating result.

But – as stated in chapter three – these efforts are already taken. Additionally, the Basel Committee as well as Rating Cert e.V. take care of eventual necessary certification methods, or – in case they decide on the free market system securing the quality of the offered ratings – of a framework of principles to be fulfilled by a rating agency they support. So we can conclude that there is still need for improvement but the first steps for adequate rating procedures and modeling default risk also of medium sized companies are definitely already taken.

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Naujos tendencijos nustatant mažų ir vidutinių įmonių reitingus pagal BASEL II

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Pastaraisiais dešimtmečiais Europos išorinių reitingų infrastruktūroje esminių tendencijų nebuvo. Ypač mažų ir vidutinių įmonių (MVI) atveju, nes nebuvo prielaidų objektyviam reitingui nustatyti. Svarbiausia to priežastis – tai informacijos asimetrija tarp investuotojų ir mažų bei vidutinių įmonių kapitalo poreikių. Tačiau pastarieji kapitalo susitarimai Bazelio Bankų Priežiūros Komitete kardinaliai keičia situaciją. Mūsų straipsnyje parodoma, kad vidutinio masto įmonių reitingavimas yra reikalingas Basel II įgyvendinti. Mes taip pat apžvelgiame charakteristikas, kurios turėtų būti ištrauktos į tokį reitingavimą ir toliau aprašome modelius, produktus bei kompanijas šiame sektoriuje. Neryškių aibių logika bei neuro-tinklai yra ypač naudotini MVI reitingavimui.