Credit Ratings and Complementary Sources of Credit Quality Information

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Summary of Project and Findings

Bank regulation has made increasing use of external credit ratings in recent years. One of the key examples of such applications is the package of rules for determining the required capital with respect to market risk in the trading book, issued by the Basel Committee on Banking Supervision (BCBS) in 1996. More generally, external credit ratings are incorporated in financial regulation, with explicit recognition of selected credit rating agencies by some regulators in some jurisdictions.

The discussion process that led to the June 1999 BCBS proposal for a revised international capital accord followed this trend, culminating in a more prominent proposed role for credit ratings in the determination of overall capital for banking institutions. A key part of this discussion process was the initiation of research in the field of credit ratings, which is of primary importance in order to arrive at informed decisions. However, the volume of information and research in this field is so large, and the process of revising the capital accord is so dynamic, that the BCBS identified a need to approach this research problem in a more systematic way.

Thus, in September 1999, the BCBS's Research Task Force formed a working group to collect the available and relevant information on credit ratings in a single document, to be made available to all BCBS groups considering the incorporation of these ratings in the new accord. Given the progressive timetable already in place for revision of the accord, the working group has moved very quickly to address the needs of various drafting and review groups. The result is a lengthy detailed study, which should be helpful to those revising the proposed accord, and more generally to those interested in the use of credit ratings in regulation.

An important principle guiding the approach of the working group is the focus on factual information, rather than subjective assessments or explicit policy recommendations. In some cases, the evidence may point clearly to a particular policy option, in which case it may be hard to distinguish between factual result and policy recommendation. In general, however, there will be real policy choices, and it has been the goal of the working group in those cases to provide directly relevant background material through the study.

The factual material may be classified into four basic categories. First, there are direct facts about the credit ratings industry, such as lists of rating agencies, the extent of their activities, market practices, etc. Many of these facts were previously available to the public, but were not collected in a single reference source. Second, the study contains factual information about alternative public sources of credit quality information. These sources include credit registers, export ratings, accounting-based and market-based scores, published surveys, and new rating agency products.

Third, the study summarises the results of earlier research on credit ratings from various sources, including academics, supervisory institutions, and rating agencies. The vast majority of this research is empirical. It has focused on issues that are quite relevant to the purposes of the present study, including the predictive performance of credit ratings and other indicators, cross-sectional differences in performance across various dimensions, and the trend and cyclical behaviour of credit ratings. Finally, a fourth category of factual material consists of empirical work performed specifically for this study. The purpose of this work is primarily to

fill in a few gaps in the existing empirical literature. Overall, it is difficult to span the whole breadth of a field like this in a single study, but the working group has attempted to make a wide range of relevant material readily available to participants in the review of the capital accord.

The study contains three main parts, namely, (I) an overview of the ratings industry and of its use in banking regulation, (II) a survey of complementary sources of credit quality information, and (III) a review of studies of the performance of credit ratings. As noted, the focus of the study is on factual information. However, a brief review of the conceptual issues regarding credit ratings is presented in the preface that follows this summary. The preface offers some preliminary thoughts about a possible framework for approaching the factual results. The remainder of the summary reports some of the key findings of the individual sections.

Sections I.A.-I.C. Overview and Survey of Current Institutions: Rating Agencies, Methodology and Ratings Definitions, and Market Practices

Information on the coverage of bond issuance by rating agencies is generally available to the public from a wide variety of sources, including the rating agencies themselves. In addition, information about the practices followed in the market is also fairly accessible. However, while it may be easy to find the answer to a specific narrow question, the dispersion of the information makes it very difficult to get an accurate global view of this important market sector. Sections A through C of part I of the study attempt to provide such a global view to the extent that it is possible in a sector that has become much more dynamic in recent times.

Section I.A. focuses on fairly direct information about the size and nature of the operations of rating agencies. It contains lists of agencies that were identified in the study, with information about size (number of employees, capital, revenue, ratings assigned), ownership, and geographic distribution of ratings. The list includes major global agencies as well as a range of regional firms as well.[1]

Preliminary information as to the coverage of the rating agencies consists primarily of an indication of the proportion of the total of rated issuers that is covered by each of four major agencies. The figures suggest that even the global agencies tend to specialise to some extent. For instance, in the coverage of industrial companies, both Moody's Investor Service and Standard & Poor's cover relatively large proportions of US and European issuers.[2] However, Moody's seems to have the largest share of ratings in Asia, while S&P has more extensive coverage in Latin America.

Section I.B. reviews the methodologies used by the agencies. Rating schemes dominate the models used by the largest companies, Moody's and S&P, but some of the regional agencies

[1] The large agencies include Duff & Phelps, Fitch IBCA, Moody's, and S&P. Countries represented in the list of regional agencies include Austria, Canada, Germany, Japan, Malaysia, Sweden, and the United States.

[2] The European figures available so far also include the Middle East and Africa.

deviate from these standards, principally in the direction of simplification. Most firms report that they rate risk on a relative – rather than absolute – scale, and most indicate that they rate "across the business cycle," suggesting that ratings should in principle not be significantly affected by purely cyclical influences.

Section I.C. contains a brief review of selected market practices, primarily in the areas of fees and unsolicited ratings. With regard to fees, there is a clear distinction between the larger global firms and the regional firms as to the direct source of fee income. Large agencies customarily charge a fee to the rated entity for issuing a rating. Regional agencies, in contrast, predominantly obtain their fee income from subscribers to their rating information. This difference probably arises from a variety of factors, such as global reputation, regulatory certification, and general availability of rating information.

Size appears to have no role in determining which agencies issue unsolicited ratings and which do not. Among some of the larger firms, Moody's and Fitch/IBCA issue unsolicited ratings, whereas Duff & Phelps does not.[3]

Section I.D. Regulatory Certification Procedures

This section reviews the regulatory use of external credit ratings, particularly by banking regulators, in the G10 countries as well as in a few selected non-G10 countries. Some clear patterns emerge from the analysis. First, virtually all the countries examined use credit ratings in financial regulation. Second, among the G10 countries, the primary use in banking regulation is in connection with the 1996 Basel rules for capital with regard to market risk. An extension to this usage occurs in Switzerland, in which sovereign ratings are used to supplement the OECD/non-OECD distinction in the Basel Accord.

The criteria used for recognition of rating agencies are generally consistent in spirit with the June 1999 BCBS proposal, though the precise wording of the criteria differs from country to country. The countries surveyed tend to recognise the large global rating agencies, with very few exceptions. Not surprisingly, the regional agencies are more likely to be recognised by authorities in their local regions. A counterexample is that of a Japanese rating agency that is recognised by regulators in three countries, but is not officially recognised in Japan. Lack of official recognition does not necessarily signify a negative view of the agency, which has a market following, but the phenomenon seems interesting from the point of view of the design of international rules for recognition of agencies.

The countries surveyed generally have procedures for reviewing the recognition of individual agencies, and the section examines recent changes. Primarily because regulatory recognition is a relatively recent phenomenon, all reported changes involve additions of new agencies, rather than de-recognition of existing choices.

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[3] S&P issues "pi" ratings, which are in effect unsolicited, but are explicitly labelled as being derived from public information only.

Section II.A. Regionally Based Credit Scoring

The main focus of this section of the study is on entities generally known as "credit registers," which have been suggested as a source of credit quality information that may usefully complement external credit ratings in the context of a standardised approach to capital. The section examines, among other things, central credit registers (CCRs) and scoring systems based on central financial statements databases (CFSDs). In general, CCRs and CFSDs are services provided by several European central banks, sometimes jointly with the private banking sector. They collect, process, manage, and release information on banks' credit exposures (CCRs) and on the credit quality of bank counterparties (CFSDs).

CCRs and CFSDs in the countries under review[4] show common features with respect to core information services, but exhibit some differences with regard to non-core information. For example, CCRs all cover exposures to corporate and sovereign counterparties, but they differ as to the inclusion of data on private customers or financial institutions. In contrast, CFSDs focus on corporate entities. Database sizes vary substantially but, in general, data collection is designed to capture the largest 10% to 20% of counterparties, which account for 80% to 90% of the total exposure or business activity.

With regard to data collection and processing, central banks often use their own branch networks and systems, but may operate joint ventures with the private banking sector. Banks and reporting firms are the main recipients of CCRs and CFSDs outputs, and general or tailored studies using CFSD data may be publicly released.

The underlying rating methodology is a critical point in assessing the reliability of a credit information system. The systems under review focus on the assessment of counterparties' ability to meet their financial obligations, and were often originally designed to appraise the quality of bills discounted by central banks. However, in some cases the analysis may also encompass a broader view of the overall situation of rated entities. The analytical approach is either judgmental or quantitative, but present trends seem to favour quantitative models. Within models, forms of discriminant analysis are most commonly used, but alternative approaches like expert systems may be observed.

Section II.B. Export Credit Ratings for Sovereigns

Various countries have established national schemes, generally known as "export credit agencies," to provide credit insurance or to assist in the funding of credit for exports. Though operated independently in each country, many of these agencies form part of an agreement, negotiated at the OECD, to introduce a level of consistency in the determination of the national entities' ratings.

Export credit ratings could potentially be used to supplement external credit ratings for regulatory purposes. In practice, however, both the individual agencies and the OECD have concerns about the use of these ratings for purposes other than the ones for which they were

[4] Austria, Belgium, France, Germany, Italy, Portugal and Spain.

developed. Much of the information from the agencies is only available to the intended users on a confidential basis.

This section of the study describes these arrangements in some detail, and presents statistical analysis of the ratings from six of the agencies, which provide these to the public through the internet. The statistical results focus on the consistency of the ratings across agencies in different countries and on the consistency of these ratings with external credit ratings.

With regard to cross-country consistency, rank correlations were computed for the sovereign borrowers rated by all six agencies. These rank correlations were very high, ranging from 93% to 100%. Thus, although the agencies in different countries operate somewhat independently, their determinations are largely consistent.

When rank correlations are computed between the average export credit ratings and the external ratings of three large credit rating agencies, the results are similarly high. In this case, rank correlations with two of the credit rating agencies were 94%. In the third case, the rank correlation is 87%, but this lower number seems to be explained mostly by a single outlier observation. Thus, the overall conclusion is that export credit ratings, though not identical across countries or to external ratings, are quite consistent in both dimensions.

Section II.C. New Products from Rating Agencies

The traditional rating agency product is an assessment of the credit quality of individual debt issues of a firm. In recent years, rating agencies have expanded their coverage to other debt products and have introduced variants or refinements of their traditional products. In some cases, such as ratings on structured debt, the concept of credit rating is essentially the same as before, although the debt product may be more complex.

This section describes four products of rating agencies that might possibly serve as complements to more traditional ratings in a regulatory regime that relied on external credit ratings. First, issuer ratings make it possible to expand the universe of firms with credit ratings beyond those that have issued public debt. Second, bank loan ratings adjust for differences in expected recoveries often observed for bank loans in default relative to bonds in default. Third, bank financial strength ratings, by measuring stand-alone credit quality, allow an assessment of the dependence on the safety net for any particular set of banks. Finally, sovereign ceilings, which reflect country risk, denote the maximum foreign-currency rating that an entity domiciled in a particular nation can receive, with very few exceptions.

Section II.D. Published Surveys

Because of the relative lack of public data on the credit quality of sovereign debt, several publications produce periodic surveys of this sector. This section of the study reviews the sovereign debt surveys of *Institutional Investor*, *Euromoney*, and the Economic Intelligence Unit of *The Economist*. The surveys are based, respectively, on staff assessments at about 100 large banks, on findings of a panel of external experts, and on internal staff analysis.

Published research papers have compared the ratings issued by these publications to other types of credit quality information. For example, one study reviewed the relationship of these ratings to standard quantitative measures of country risk (e.g. macroeconomic and external debt measures). The explanatory power of the statistical equations was fairly high, ranging from 77% for *Euromoney* to 97% for *Institutional Investor*. Other research has investigated correlations between the published ratings, on one hand, and market spreads or external credit ratings, on the other. These empirical correlations also tend to be quite high.

Section II.E. Measurements of Probability of Default based on Accounting Data

Statistical scoring methods combine and weight individual accounting ratios to produce a measure – a credit risk score – that discriminates between healthy and problem firms. The most widely used statistical methods are discriminant linear analysis and probit/logit regression.

The classic Fisher linear discriminant analysis seeks to find a linear function of accounting variables that maximises the differences (variance) between the two groups of firms while minimising the differences within each group. The variables of the scoring function are generally selected among a large set of accounting ratios on the basis of their statistical significance. The coefficients of the scoring functions represent the contributions (weights) of each ratio to the overall score.

Logit analysis uses a set of accounting ratios to predict the probability of borrower default, assuming that the probability of default takes a logistic functional form and is, by definition, constrained to fall between zero and one.

All in all, multivariate accounting-based credit-scoring models have been shown to perform quite well. In particular, linear discriminant analysis seems robust even when the underlying statistical hypotheses do not hold exactly, especially when used with large samples. Logit analysis has produced similar results. Some recent studies use both methods and choose the one with the best out-of-sample performance, to avoid problems of sample-specific bias and overfitting.

A relatively new – and less thoroughly tested – approach to the problem of credit risk classification is based on artificial intelligence methods, such as expert systems and automated learning (neural networks, decision trees and genetic algorithms). These methods dispense with some of the restrictive assumptions of the earlier statistical models.

Section II.F. Measures Based on Market Prices

This section discusses measures of credit quality based on equity price data. These measures usually also incorporate information from financial statements. Spreads on debt instruments, which are based only on market prices of a firm's debt, are also discussed in the section.

The main advantage of market price-based measures, as compared with those based on accounting data, is that they may pick up more subtle and fast-moving changes in borrower

conditions, which may be reflected in capital market values. In addition, measures based on accounting data are often only tenuously linked to an underlying theoretical model.

There are essentially three basic types of information that are relevant to estimate the probability of default: financial statements, market prices of a firm's debt and equity, and subjective appraisals of the firm's prospects and risk. Financial statements are reflections of what happened in the past, whereas market prices are forward looking. At least in principle, prices embody the synthesised views and forecasts of many investors.

After describing in detail various price-based measures, the section provides a discussion of the measures' performance. One statistic provided is the so-called power curve test, which measures the model's ability to identify the firms that are going to default for a given lead time (12 months here). The power curve test does not require that a model determine default probabilities for companies, since only a ranking of companies is necessary. Illustrative results for a sample of companies from six European countries[5] show that the default rate for the lowest-rated 10% of firms ranges from 30% (France) to 49% (Norway).

Section III.A. Default Studies

This section looks at the power of external credit ratings to predict defaults. It draws on various sources, including reports of the rating agencies as well as academic studies of defaults. Some of the studies cited are quite recent, including papers published both by Moody's and S&P in 1999. In broad terms, the results of all these studies suggest that credit ratings constitute useful predictors of defaults at various time horizons, particularly for non-financial companies in the United States, for which the most extensive data are available. One type of evidence frequently cited in this regard is that credit ratings are very highly rank-correlated with subsequent default frequencies.

An important determinant of the predictive power of credit ratings is the date of the issuance of the credit instrument. The pattern uncovered by several researchers is that, for any given initial rating, defaults tend to increase in the first few years, level off after three to four years, and then tend to decline. This pattern, which is clearest for firms with low initial ratings, is known as the "seasoning effect."

The section also examines the evidence with regard to recovery given default, that is, of the proportion of the value of the debt instrument that is recovered by the investor in case of default. Not surprisingly, the rate of recovery increases with the seniority of the debt. However, the section reports evidence as to the numerical magnitude of this effect, which tends to be quite dramatic. For instance, junior subordinated debt tends to have recovery rates of only 14% to 20%. In contrast, senior secured debt shows rates of 55% to 66% and the rates for bank loans, which are generally very senior, range from 70% to 85%.

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[5] France, Germany, Norway, Spain, Sweden, United Kingdom.

Section III.B. Stability of Transition Matrices

This section considers three ways in which rating transition matrices may change over time (or depart from "stability"): population trends, cyclical changes, and ratings drift.[6] With regard to trends, it is readily apparent that the general pattern, at least since the early 1980s, is that a proportion of lower-rated firms has tended to increase. Superficially, this could mean that the average quality of rated firms is lower now or that rating agencies are toughening their standards. In fact, it is difficult to identify the individual importance of various specific factors, including those related to the demographics of the rated universe.

There has been a dramatic increase in the number, types, geographical dispersion, credit quality, and industrial classification of firms seeking ratings. In addition, more attention is devoted now to sectors such as sovereigns, emerging markets, and speculative grade issuers. These changes in the rated universe, together with factors such as the "seasoning effect" discussed in the previous section, combine to create the observed declining overall trend in credit quality.

The larger rating agencies report that they rate "across the cycle," that is, that they take the perspective of a full business cycle and thus factor in the expectation that the condition of a firm is likely to deteriorate at the trough of the cycle. Nevertheless, there seem to be systematic changes in ratings over the course of the business cycle. In particular, ratings of lower-rated firms tend to fluctuate more over the cycle.

Ratings drift refers to a pattern of continuing changes in rating in a given direction. If a firm is downgraded, do further downgrades become more likely or is it more likely that it will recover? The empirical evidence suggests that the results are asymmetrical for upgrades and downgrades. Specifically, downgrades are typically associated with further downgrades (there is a sort of positive serial correlation), but upgrades are not necessarily associated with further upgrades (expectations of changes remain roughly the same as before the upgrade).

Section III.C. Consistency across Sectors

If two issuers in different sectors have the same rating (symbol) from a given rating agency, is their likelihood of default about the same? The major rating agencies generally assert that this is their objective in formulating their ratings. However, looking at previous default experience by rating category for different sectors, this becomes an empirical question. This section reports the results of a series of new statistical tests designed to gauge the direction, magnitude, and significance of potential sectoral differences.

Because of data limitations, it is only possible to compare a few sectors. Of these, the clearest results are with regard to US financial versus non-financial firms, and with regard to firms domiciled in the United States versus firms domiciled elsewhere. In the first instance, there is statistical evidence that US financial firms have a higher default rate than US non-financial

[6] Transition matrices measure the probabilities of migrating from a current credit rating to another credit rating within a specific time period.

firms with the same ratings. The differences are statistically significant, though, like the default probabilities themselves are not large in absolute terms. For example, when all rating levels are considered, the difference in one-year default rates is 0.77 percentage points or less on average.

Other sectoral differences do not appear to affect default rates significantly. As to consistency in ratings across geographically distinct issuers, statistically robust comparison is difficult due to the limited amount of data on the ratings of non-US firms, particularly at lower rating levels.

Section III.D. Rating Differences across Agencies

The issue examined in this section is difficult because there is no perfectly uniform standard set of symbols in use by all rating agencies. Thus, there is generally a need to effect some translation of symbolic rating frameworks before even attempting to address the question. This section summarises the results of earlier research on the topic.

There is much data available for the two largest global companies, Moody's and S&P, both of which tend to rate almost all issuers in the United States. Furthermore, there is a commonly-used translation of their two sets of ratings categories. For these reasons, various researchers have compared the ratings of these two firms, with the general conclusion that they are fairly comparable. More noticeable differences have been found between these and other agencies active in the US markets, and among agencies in other markets, notably Japan.

Researchers have found evidence that ratings for a given issuer tend to be lower from the largest two agencies than from other agencies. Even with adjustments for sample-selection bias (firms rated by different agencies may be different), the results tend to be confirmed. It should be noted, however, that the rank correlations between ratings of each of the largest two agencies and some other US agencies are about as high as the rank correlations between the two large agencies themselves. This result suggests that the agencies are likely to be in agreement over the relative risk of borrowers.

Outside of the United States, Japanese rating agencies are among the oldest and most active. Data availability has thus attracted the attention of researchers. In this case, analysis has uncovered some fairly large differences between Japanese agencies and non-Japanese agencies, which seem to be tougher on the local issuers. Nevertheless, there may be fewer differences across agencies about relative riskiness, as there is evidence that both Japanese and non-Japanese ratings are highly correlated with market-determined credit spreads.

Members of the Working Group on Credit Ratings

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Preface: The Economic Role of Credit Rating Agencies

A prospective borrower knows more than its potential lenders about its own creditworthiness, and thus is in a position to disclose information selectively in a way that would favourably bias an outsider's opinion. Because potential lenders know that a borrower has an incentive to provide a distorted picture of its prospects, it can be a challenge, even for a low-risk borrower, to convince lenders that it would be unlikely to default. Without some means for reliably transmitting relevant information, there can be a market failure, in the sense that worthy investment projects fail to be financed.

When a bank acts as an intermediary between a borrower and the ultimate suppliers of funding, the bank can alleviate this information problem by conducting a thorough inspection of a firm's financial condition and future prospects before deciding whether, and on what terms, credit will be extended. Substantial evaluation and monitoring costs might be worth bearing for a bank that expects to be fully exposed to the risk that the borrower would default. In contrast, if the financing instead were being provided directly by a large number of small lenders, it might be the case that no single one of them would have enough at stake to provide an incentive for an adequate information-gathering effort.

When a firm borrows in public debt markets, it can be difficult for potential bondholders individually to assess the risk that the borrower will default, because the cost of an adequate credit analysis may be prohibitive. Under these circumstances, credit rating agencies can play a useful role by collecting information about a firm and sharing it with a large number of investors. Similarly, a regulatory environment that enforces accurate financial disclosure by firms wishing to issue securities also helps to enhance the flow of reliable information to investors. Such disclosure requirements could only tend to improve the quality of information available to rating agencies, even when they also have access to non-public data. Thus, banks, credit rating agencies, and disclosure requirements all serve to reduce the extent to which profitable opportunities are left unfunded.

In order for a bank or credit rating agency to have an incentive to expend significant resources in assessing a borrower's creditworthiness, it must be able to capture a portion of the benefit of the information that is uncovered. For example, when a bank bases a lending decision on proprietary information, it may prefer to keep the details of the transaction private to prevent others from capitalising on its knowledge. If a bank could not keep its credit evaluations secret from other market participants, competitors might be able to mimic the banks' lending decisions without the expense of performing independent assessments.[7] Such "free-riding" would erode the incentive for the bank to undertake credit analysis in the first place. Note that potential competitors do not necessarily have to know the details of a commercial bank's assessment of borrower risk to be able to "free-ride" – if they can observe the terms of the bank's loan contract, then they can simply offer the same deal.

[7] Syndicated loan arrangements in which the lead bank is paid an additional fee may represent an alternative means for a bank to capture part of the benefit of undertaking an independent credit assessment. For larger borrowers, other banks participating in the syndicate would likely have some prior knowledge pertinent to the risk of default.

Thus, the ability to exclude others from one's own assessment process increases the payoff to commercial banks from undertaking assessments of creditworthiness. However, a credit market with independent information-gathering and analysis by each investor has some drawbacks, with respect to efficiency. It may require either concentration of credit risk (if there is only one bank or a small number of banks vying for a borrower's business) or wasteful duplication (with many competing banks).

Credit rating agencies, unlike commercial banks, do not risk their own money on the basis of their default risk assessments. Thus, in contrast to bank financing, with credit ratings, the funding activity can be potentially separated from credit analysis, which may enable both functions to be provided in more competitive markets. Nevertheless, the viability of a credit rating agency, like a bank, depends on its ability to extract a private benefit from its credit assessment. When ratings are publicly disclosed, as has been the predominant practice for the past several decades, the rating agency obviously cannot exclude "free-riders" from learning their ratings once they are announced. Most rating agencies ensure that they will capture a portion of the benefit of their credit analysis by charging the borrower for their service rather than the investor community, which effectively spreads the cost of the ratings evenly across investors. (It is worth noting, however, that some of the more recent debt rating industry entrants make their assessments available only by subscription. It is not clear to what extent these firms are losing revenue from customers sharing information, but many other types of information and publishing businesses are similarly vulnerable.)

In order for a borrower to be willing to pay for a rating from a particular rating agency, it must believe the rating is likely to improve the terms under which it could offer debt securities in the public market. Accordingly, for the agency's rating to have value, potential investors must believe the rating has useful information about creditworthiness. Thus, a reputation for being unbiased would be a valuable asset to a rating agency. Such a reputation might be gained by a long track record of successful ratings in various markets. Some commentators have suggested that established rating agencies have enough market power to earn economic rents, as a result of natural barriers to entry. However, unlike some other industries, credit ratings would not necessarily be inefficiently under-produced in this context because, to the extent that rating fees are confidential and individually negotiated, price discrimination may be feasible.

A rating agency's reputation would also tend to be bolstered if it avoided conflicts of interest created, for example, when the rating agency is owned, managed, or otherwise influenced by those institutions being rated. However, market forces can also help keep raters honest. In the long run, as investors routinely compare ratings across agencies and the correspondence between ratings and default, a deliberate systematic bias on the part of any given agency would risk eventual discovery. In the shorter term, unsolicited ratings can also serve as a useful form of market discipline when the hired rater has been too generous.

Rating agencies' economic viability may be enhanced by proprietary systems for transforming information into ratings. In most cases, these include a combination of qualitative and quantitative judgements, although some of the newer subscription-based raters are using methods that are almost entirely quantitative. One might worry that, given employee mobility in the credit analysis profession, rating agencies would have plenty of former analysts who are well informed about their rating practices. However, this does not necessarily eliminate the value of proprietary systems if resources are required to implement a rating methodology.

Ratings-based financial regulation can potentially alter the incentives that credit rating agencies face. In the absence of regulatory use of ratings, the only value of ratings to an issuer lies in the credibility of the signal it sends to potential investors about credit quality. However, the situation changes when credit ratings determine the conditions, if any, on which an investor may buy a particular bond. A regulated investor might prefer that a credit rating on a bond simply be high enough so that it can be included in its portfolio, rather than accurately reflect the issuer's default risk. Under such a scenario, it is at least conceivable that an unprincipled rating agency would implicitly collude with a risky issuer and investors wishing to skirt portfolio restrictions by providing an inflated rating.

Such a distortion might be avoided if regulators apply a process for certifying rating agencies' ratings for regulatory use that uses similar criteria to what investors use when determining which rating agencies provide them with credible signals about credit quality. In an international context, ratings-based capital requirements that rely on this sort of synthetic market discipline would be most effective if regulators cooperate closely, so that the certification criteria are harmonised across borders. Absent such coordination, international banks would have an incentive to book a rated asset in the country that certifies the rating agency with the most benign view of the underlying credit risk.

In addition to bond ratings published by credit rating agencies, there are other mechanisms through which credit information can be disseminated. In some countries, credit information about bank loans and borrowers is shared through private credit bureaus. With participation voluntary, member banks implicitly are judging that it is worth revealing information about their own customers in exchange for access to information about other potential customers. In some other countries, banks are required to share information about their borrowers through publicly administered national credit registers. Interestingly, there is evidence that the existence of a credit register or credit bureau is a deterrent to borrower default and consequently a stimulus to aggregate bank credit (see Jappelli and Pagano, 1999), despite the clear impediment to individual banks benefiting from proprietary credit information.

For both credit bureaus and credit registers, no more information is shared, generally, than would have to be provided in a prospectus or offering circular for a public bond issue. Thus, disclosure requirements would seem to be a closer institutional analogue to these mechanisms than bond credit ratings. Nevertheless, in several countries with public credit registers, the government produces ratings for the borrowers on the basis of the submitted information. Although the principal motivation for these assessments has been for direct use in bank supervision, one could imagine an expansion of their application to ratings-based capital requirements.

Nevertheless, it does not seem that credit assessment is an activity that would be performed most effectively in the public sector, given that a number of viable competitors have arisen in the private sector. The prevalent economic view suggests that governments should only provide goods and services that cannot be produced profitably by private firms because non-paying customers cannot be prevented from enjoying the benefits. (An oft-cited example of a so-called public good is national defense.) However, even though it may be difficult to prevent investors from using published credit ratings without explicitly paying for them, rating agencies have found an alternative way to make their business profitable – charging rating fees to bond issuers.

Part I. Overview and Survey of Current Institutions

Section A. Rating Agencies: Size, Ownership, Geographic Distribution of Ratings Assigned, Global versus Regional Focus (Annex I.A, pp. 21-22)

Introduction

In the consultative paper published by the Basel Committee on Banking Supervision in June 1999 ("Consultative Paper")[8], the proposal to assign risk weights derived from an external credit assessment has resulted in an examination of the role played by external credit assessment institutions. The consultative paper refers to ratings in the public domain and, for that reason, this section focuses on rating agencies[9], specifically those that make their ratings available by subscription or otherwise.

The rating agencies surveyed were identified from returns provided by the national supervisors and central banks from the G10 countries[10] (except Luxembourg). The survey produced a list of 26 unique entities, and two significant others, Rating Agency Malaysia Berhad [RAM] and Capital Intelligence, which came to light during the course of the study. The original figure of 26 included both Duff & Phelps and Fitch IBCA although, following the inception of this study, the merger of these agencies was announced and legally completed on 1 June 2000. This merger will see the number of "major" established agencies decrease but, for the sake of comparison, data on the two components and the merged entity (available from the Fitch IBCA Internet site) are included.

Rating Agencies

At the outset of this exercise in September 1999, it was believed that there might be some 130 agencies world-wide, although industry sources indicated this number was closer to 150. Although the merger mentioned above will reduce the number of "major" established agencies, there is anecdotal evidence to suggest that the total number of agencies will increase in future, most noticeably in the less developed markets.

Based on the data gathered, it appears there is a wide disparity in size among rating agencies, as measured by the number of employees or number of ratings assigned (see Annex I.A). The latter measure – the number of ratings assigned – is ambiguous in that it is dependent on whether there is intensive analytical work done on the institution being evaluated, or whether

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8 "A New Capital Adequacy Framework", Basel Committee on Banking Supervision (June 1999).

9 The term "rating agency" is used here to denote commercial organisations which assess the creditworthiness of obligors and excludes Credit Registers, Industry Co-operative Activities, Guarantee Programs, Export Credit Ratings for Sovereigns, and other research bodies.

10 Belgium, Canada, France, Germany, Italy, Japan, Luxembourg, the Netherlands, Sweden, Switzerland, the United Kingdom, the United States.

the rating exercise consists of using published data as input to a statistical model. It should be noted that both of these approaches might satisfy the requirement of "*ongoing review and [responsiveness] to changes in financial condition*" as required by the "objectivity" criterion in the Consultative Paper.

Furthermore, whereas some agencies strive to exert a global reach (most prominent in the US-based agencies), there may be an apparent "cultural" effect where other agencies seek to find niche markets, either in terms of sector and/or geographic specialisation (perhaps most noticeable in the Swedish agencies).

A distinction must be made between agencies that provide ratings (either solicited or unsolicited) on a limited number of firms, and those that have the capability to rate all of the companies in a given marketplace using statistical models. The second group of agencies, most evident in Sweden and focussing on the Swedish or Nordic marketplace, use objective financial data that can be easily captured by mechanical means, thereby dispensing with the need for large numbers of trained analysts. The scope exists, therefore, for this group of agencies to assign ratings to all firms within their chosen sphere of operations, effectively achieving 100% coverage of the marketplace.

It may be seen that a significant number of the agencies are subsidiaries of larger entities. This might be seen to be of concern where the parent is involved in either the rating or financial services industries (for example, Italrating DCR), but being of less concern where there are a large number of shareholders with no single entity having dominant control (such as RAM). As has been mentioned by a number of practitioners in the rating agency industry, however, their integrity and credibility is seen to be paramount to their standing in the industry and stem from their perceived freedom from interference from external sources.

Agencies might be defined as belonging to one of three categories:

- National
- Regionally targeted
- Global

Members of the first of these categories are especially evident in Sweden, where a number of agencies use statistical models to determine the creditworthiness of practically the entire national market. The second category includes agencies, such as Capital Intelligence, which through organic growth and acquisition have chosen to restrict its focus to specific regions (such as Gulf/Mediterranean, Asia/Pacific, and Central/Eastern Europe in the case of Capital Intelligence). Finally, there are the truly global agencies. Membership of this category seems to be dependent upon reaching some critical mass.

Section B. Methodology and Ratings Definitions (Annex I.B, pp. 23-24)

There is a preponderance of scales, in general based upon an alphabetical taxonomy. This may be related to the desire to avoid the connotations of cardinality that might be immediately associated with a numerical rating scale, although an ordinal numerical scale is used by some agencies.

In the table (Annex I.B), an agency's designation of "probability of default" (PD) does not necessarily denote that an explicit PD is calculated for the issuer/issue. Rather, this indicates that the rating scale is based upon the likelihood of default. Only two of the agencies, namely KMV Corporation (US) and Upplysningscentralen AB (Sweden), undertake the calculation/derivation of an explicit PD. The rest of the agencies base their ratings on the relative likelihood of default, pointing out that they are not in the business of assigning absolute probabilities of default to the issuer/issue, but rather they seek to construct an ordinal, relative ranking of the ability to service debt. While some agencies do produce default studies with calculated PDs by rating class, this is an *ex post* analysis. In contrast, Moody's considers the "loss given default" dimension when assigning a rating (see Annex III - Rating Agencies: Notes, p. 28). Some of the Swedish agencies may give implicit consideration to this element when deriving suggested upper limits for obligors.

Section C. Market Practices (Annex I.C, p. 25)

Two types of fees might be distinguished. Firstly, those paid to access the rating of an obligor from a private database – in effect a subscription fee, usually of the order of tens of dollars – and secondly, those paid to "commission" a rating that is then made publicly available. The fees charged for the latter service may vary both across agencies and across the marketplaces in which the rating is assigned.

The agencies that use statistical models reliant upon publicly available data (generally subscription-based services) have no overriding need to obtain access to proprietary information. They are able to produce a rating, which might be termed "unsolicited", without a request from, or the collaboration of, the entity being rated. The ability of a firm to challenge a rating is, therefore, limited to the extent that relevant information is in the public domain, and where it is made aware of the rating assigned to it. As an example, for the Swedish agencies that use statistical models, the level of notification received by the firm being rated is dependent upon the nature of the firm:

- If the company is an unregistered firm, the rated firm **will always** be notified that someone has sought a rating
- If the company is limited by shares or is a limited partnership, it **may** be notified depending on the rating information content:
  - When the report contains only the rating class, the rated firm **will not** be notified.
  - When the report contains information about owners, board members or officers of the company, the rated firm **will** be notified.

If a firm has been advised of an assigned rating with which it disagrees, it is possible to raise this with the agency. It is presumed that the agency has a sufficiently transparent method/model to be able to explain the reason(s) for assigning the rating. (For this reason, it appears that the models being used are becoming more transparent and less "black box" in nature.)

Unsolicited ratings may be more of an issue where the entity being rated would otherwise have to pay a fee to obtain a solicited rating. If the rating is at the lower end of the scale, does this "drive" the entity to obtain a solicited rating with consequent payment of a fee? Whilst the larger agencies have generally sought to distinguish clearly between the two categories of ratings, a notable recent development is evident in the declaration by Moody's that unsolicited ratings will be declared as such in any initial rating assignment press release (see Annex III - Rating Agencies: Notes).

Coverage Parameters (Annexes IV.A-F, pp. 34-39)

Data that might be used to derive "coverage parameters"(both the absolute number of ratings assigned and the size of the universe of possible firms to rate) has proved predictably difficult to gather. This is due to the problems inherent in defining the numerator (issuers or issues) and the denominator (public/private companies, even the definition of a company under different jurisdictions) in this ratio. The suggestion implicit in the Consultative Paper is that **issuers** should be considered rather than issues.

In looking at the coverage of ratings in different markets, a distinction must be made between those agencies that provide ratings, solicited or unsolicited, on a limited number of firms; and agencies that have the capability to rate all companies in a given market using statistical models. In the latter group, these agencies can effectively produce 100% coverage as a rating can be produced upon request and payment.

Banks, Industrials, Corporate Ratings by Agency and Country / Number of Businesses (Annex IV.G, p. 40)

The coverage parameters in Annexes IV.A and IV.B are derived by using as the denominator the number of entities rated by at least one of the four rating agencies in the tables. A more informative statistic of the "penetration" of ratings would be if the denominator were to represent the universe of entities "eligible" to be rated, but this is a problematic set to determine and has fuzzy boundaries.[11] To present an admittedly sketchy view about the comparative size of the possible universe of such entities across countries, Dun & Bradstreet have provided data on the number of businesses with turnovers in excess of USD 10 million, USD 50 million, USD 250 million and USD 500 million. However, the company has not provided the ratings associated with these businesses (Annex IV.G). **As such, the figures should be interpreted only as a crude indicator of the relative size between countries of the possible pool of entities that might be rated**.

In the context of the revision of the Basel Accord, it is also important to realise that there is a second major drawback to these figures. The data considers only the absolute number of rated entities/businesses, and **not** their related exposure to the banking industry (i.e. it is not "weighted" by the bank borrowing of the entities/businesses).

[11] "Eligibility" is not defined by hard and fast criteria, but may also be dependent upon the desire of an obligor to obtain a rating for a number of subjective reasons, such as peer group comparison.

Trade Organisations

Currently there appears to be no global trade organisation for the rating industry, although the ASEAN Forum of Credit Rating Agencies (AFCRA) was formed in 1995 by rating agencies from Indonesia, Malaysia, the Philippines and Thailand. (It is believed that a trade organisation may have been set up recently in Germany.)

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General notes to Annexes

1. Data in the tables contained in Annexes I.A-C, Annex II and the notes in Annex III has been obtained from responses provided by G10 supervisors and central banks (except Luxembourg), or obtained directly from publicly available sources, including reports and Internet sites.

2. Data in Annexes IV.A-E has been obtained from the FT Credit Ratings International database for January 2000, this source also being used for Annex IV.G in conjunction with data from Dun & Bradstreet on the number of businesses as at March 2000. **It is important to note that the comparability of figures in these tables is ultimately dependent upon there being a consistent definition of the "rating" across the agencies by the compiler of the data; in this case, this is defined as:**

   "the rating assigned to long-term senior unsecured or senior subordinated debt. In a relatively small number of cases the representative rating refers to secured debt (e.g. particularly for US utilities) or convertibles (e.g. Particularly Japanese issuers) or may be supported by a third-party or parent guarantee. In the case of banks, the long-term rating often refers to deposits".

3. Data in Annex IV.F is sourced from a note produced by Salomon Smith Barney in June 1999.

4. Where there is a blank entry in Annexes I.A-C and Annex II this indicates that the information was not available.

5. Following the merger of Duff & Phelps and Fitch IBCA in June 2000, the merged entity is denoted here by "Fitch (2000)" and the entries for this agency and the constituent parts, prior to June 2000, appear near the end of the tables in Annexes I.A to I.C, Annex II and the notes in Annex III. In the remaining tables, the figures on

number of ratings for the constituent agencies have not been aggregated due to the possibility of double-counting.

6. The entries for the two non-G10 agencies have been placed at the end of the Annexes.

7. Collection of this information has been ongoing since the last quarter of 1999 and some of the material contained in the Annexes has been taken directly from the Internet site of the relevant organisation or from publicly available documents: therefore, some notes may derive from information previously posted but no longer present on the Internet site of the organisation.

Annex I.A – Rating Agencies: Size, Ownership, Geographic Distributi Global versus Regional Focus

Rating Agency	Employees	Ratings Assigned	Ownership
A.M. Best Co.	> 400 analysts, statisticians, and editorial personnel	5,400	Independent
Bonniers Kreditfakta I Norden AB	20	All companies (780,000)	The Bonnier Group
Canadian Bond Rating Service	35	> 500 corporate and public sector issuers	Private
Credit Safe AB	21	690,000 out of 770,000 (in Sweden)	Norwegian company
Dominion Bond Rating Service	30	> 500 corporate and government issuers	Private
Dun & Bradstreet	11,000	Database of 53m companies	Independent
Egan-Jones Credit Rating Co.		2,000 companies	
Euro Ratings AG	7 analysts		Independent shareholders
Instantia Creditsystem AB International	5	All companies (780,000) via KreditFakta databases	Private (The Köster family)
Italrating DCR SpA		53	One Italian investment bank (50% o capital) and Duff & Phelps (15% of capital)
Japan Credit Rating Agency, Ltd (JCR)	74	600	Leading institutional investors, inclu major insurance companies and ban
Japan Rating And Investment Information, Inc. (R&I)	140	1,100	Nikkei Newspaper
KMV Corporation		25,000 firms	Independent
Lace Financial Corp.		1,000 largest US banks; 250 foreign banks; 2,500 largest US credit unions; 35 largest title insurance companies	
Mikuni & Co		4,000 issues / 1,600 firms	Independent
Moody's Investors Service	1,500	> 9,000	Dun & Bradstreet
Neufeld's Credit Information AB	2	A few companies	Private (Robert Neufeld)
R@S Rating Services AG	8 analysts		Independent, major share holder Bavarian employer's association

Rating Agency	Employees	Ratings Assigned	Ownership
Standard & Poor's	1,000 analysts	3,478 global corporate issuers (1997); 2,614 US corporate issuers (1997)	McGraw-Hill (publishing and media
SVEA Kredit-Information AB	3	All companies (780,000) via KreditFakta databases	Private (Lennart Ågren)
SVEFO Sverige AB	30	All companies (780,000) via KreditFakta databases	Telia AB (largest phone company)
Thomson Financial Bankwatch	69 analysts	> 1,000 (650 issuers, 400 issues)	Thomson Corporation
Unternehmensratingagentur AG (URA)	12 analysts		Independent
Upplysningscentralen AB (UC AB)	160	All companies (780,000)	4 largest private Swedish banks
Merged agencies			
Duff & Phelps Credit Rating Co.	*> 600 employees*	*68% of Latin American debt issues, 64% Chile, 77% Costa Rica, 45% Mexico, 75% Peru, 100% Colombia, 70% Venezuela*	*Independent*
Fitch IBCA	*400 analysts*	*10,163 global issuers; 9,033 US issuers*	*FIMALAC (French conglomerate)*
Fitch (2000)	*1,100 employees*	*1,600 financial institutions, over 800 corporates and 700 insurance companies, 67 sovereigns, 3,300 structured financings and 17,000 municipal bonds ratings (US tax-exempt market)*	*FIMALAC (French conglomerate)*
Outside G10			
Rating Agency Malaysia Berhad (RAM)			*Owned by commercial, merchant b finance companies, Asian Developr Bank, Fitch IBCA*
Capital Intelligence	*11 analysts*	*> 400 banks*	*Independent*

Notes

1. Ratings assigned may be either to issuers or to issues. (Further work is needed to consider how multiple issue r representative issuer rating.)

Annex I.B – Rating Agencies: Methodology and Ratings I

Rating Agency	Symbols	PD vs EL
A.M. Best Co.	A++, A+ (Superior), A, A- (Excellent), B++, B+ (Very Good), B, B- (Fair), C++, C+ (Marginal), C, C- (Weak), D (Poor), E (Under Regulatory Supervision), F (In Liquidation), S (Rating Suspended)	
Bonniers Kreditfakta I Norden AB	1 (worst) to 5 (best)	PD
Canadian Bond Rating Service	A++, A+, A, B++, B+, B, C, D, Suspended	
Credit Safe AB	0 (worst) to 100 (best)	PD
Dominion Bond Rating Service	AAA, AA, A, BBB, BB, B, CCC, CC, C, D	PD
Dun & Bradstreet	AAA, AA, A, B, C (AAA best, C worst)	PD
Egan-Jones Credit Rating Co.		
Euro Ratings AG	AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-, B+, B, B- , CCC+, CCC, CCC-, CC, D	PD
Instantia Creditsystem AB International	1 (worst) to 5 (best)	PD
Italrating DCR SpA	AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-, B+, B, B- , CCC, DD (see note)	
Japan Credit Rating Agency, Ltd (JCR)	AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-, B+, B, B- , CCC, CC, C, D	
Japan Rating And Investment Information, Inc. (R&I)	AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-, B+, B, B- , CCC, CC	
KMV Corporation	n/a	PD
Lace Financial Corp.	A+, A, B+, B, B-, C+, C, D, E	
Mikuni & Co	AAA, AA, A, BBB, BB, B, CCC, CC, DDD	
Moody's Investors Service	Aaa, Aa1, Aa2, Aa3, A1, A2, A3, Baa1, Baa2, Baa3, Ba1, Ba2, Ba3, B1, B2, B3, Caa1, Caa2, Caa3, Ca, C *(see note)*	EL
Neufeld's Credit Information AB	No formal grading scheme	PD and EL
R@S Rating Services AG	AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-, B+, B, B- , CCC+, CCC, CCC-, CC, D	PD
Standard & Poor's	AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-, B+, B, B- , CCC+, CCC, CCC-, CC	PD
SVEA Kredit-Information AB	1 (worst) to 5 (best)	PD
SVEFO Sverige AB	1 (worst) to 5 (best)	PD
Thomson Financial Bankwatch (Issuer)	A, A/B, B, B/C, C, C/D, D, D/E, E	
Thomson Financial BankWatch (Long Term)	AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-, B+, B, B-, CCC, CC, D	

Rating Agency	Symbols	PD vs EL
Thomson Financial Bankwatch (Sovereign)	AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-, B+, B, B-, CCC, CC, C, D	
Unternehmensratingagentur AG (URA)	AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-, B+, B, B- , CCC+, CCC, CCC-, CC, D	PD
Upplysningscentralen AB (UC AB)	1 (worst) to 5 (best) [Grade 1 PD > 26%, grade 5 PD < 1%]	PD
MERGED AGENCIES		
Duff & Phelps Credit Rating Co.	*AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-, B+, B, B- , CCC, DD*	*PD*
Fitch IBCA	*AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-, B+, B, B- , CCC+, CCC, CCC-, CC, C, DDD, DD, D*	*PD*
Fitch (2000)	*AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-, B+, B, B- , CCC+, CCC, CCC-, CC, C, DDD, DD, D*	
OUTSIDE G10		
Rating Agency Malaysia Berhad (RAM)	*AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-, B+, B, B-, C, D*	
Capital Intelligence	*AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-, B+, B, B-, C, D*	

Notes

1. "Point-in-time methods" are categorised here as using current accounting data supplemented by proprietary me point in time.

Annex I.C – Rating Agencies: Market Practices

Rating Agency	Payment By	Unsolicited Ratings
A.M. Best Co.		
Bonniers Kreditfakta I Norden AB	Subscriber	Y
Canadian Bond Rating Service		
Credit Safe AB	Subscriber	Y
Dominion Bond Rating Service		
Dun & Bradstreet	Subscriber	Y
Egan-Jones Credit Rating Co.		
Euro Ratings AG		N
Instantia Creditsystem AB International	Subscriber	Y
Italrating DCR SpA	Rated body	N
Japan Credit Rating Agency, Ltd (JCR)	Rated body	Y
Japan Rating And Investment Information, Inc. (R&I)		
KMV Corporation	Subscriber	Y
Lace Financial Corp.	Subscriber	
Mikuni & Co	Subscriber	
Moody's Investors Service	Rated body	Y
Neufeld's Credit Information AB		Y
R@S Rating Services AG	Rated body	N
Standard & Poor's	Rated body	N
SVEA Kredit-Information AB	Subscriber	Y
SVEFO Sverige AB	Subscriber	Y
Thomson Financial Bankwatch (Issuer)		
Thomson Financial Bankwatch (Long Term)		
Thomson Financial Bankwatch (Sovereign)		
Unternehmensratingagentur AG (URA)		N
Upplysningscentralen AB (UC AB)	Subscriber	Y
MERGED AGENCIES		
Duff & Phelps Credit Rating Co.		N
Fitch IBCA		Y
Fitch (2000)		
OUTSIDE G10		
Rating Agency Malaysia Berhad (RAM)	Rated body	
Capital Intelligence	Subscriber	Y

Notes

1. With the exception of KMV and Lace Financial, the subscriber fee charged is for access to the rating of a single company (including own rating).

Annex II – Rating Agencies: Background Informa

Rating Agency	Internet site	Current Form	Head Office	Type of claim
A.M. Best Co.	www.ambest.com	1899	US	Debt and preferred stock of insu paying abilities of insurance compa
Bonniers Kreditfakta I Norden AB	www.kreditfakta.se			Public and private companies
Canadian Bond Rating Service	www.cbrs.com	1972	Canada	Bonds and short-term paper (cor and municipal)
Credit Safe AB	www.creditsafe.se			Public and private companies
Dominion Bond Rating Service	www.dbrs.com	1976	Canada	Bonds and short-term paper (cor and municipal)
Duff & Phelps Credit Rating Co.	www.dcrco.com	1932	US	Fixed income issues (corporate finance)
Dun & Bradstreet	www.dnb.com	1933	US	Companies' financial strength, cr performance
Egan-Jones Credit Rating Co.				High yield/high grade corporate iss
Euro Ratings AG		1999	Germany (Frankfurt)	Medium-sized corporations
Fitch IBCA	www.fitchibca.com	1997	France	Debt and preferred stock of governments, structured financing
Instantia Creditsystem AB International	www.instantia.se	1982	Sweden	Public and private companies
Italrating DCR SpA	www.italrating.com	1996	Italy	Bonds (corporate, local governm companies, structured finance
Japan Credit Rating Agency, Ltd (JCR)	www.jcr.co.jp	1985	Japan	Bonds (sovereign, corporate), com
Japan Rating And Investment Information, Inc. (R&I)	www.r-i.co.jp	1985	Japan	Bonds (sovereign, corporate), com
KMV Corporation	www.kmv.com	1989	US	Corporate default risk of commer and insurance companies
Lace Financial Corp.	www.lacefincl.com	1984	US	Issuance of title insurance comp bank holding companies, credit uni
Mikuni & Co	www.nttl-net.ne.jp/mcr	1975	Japan	Corporate issuers including industri institutions. In addition, bank guara
Moody's Investors Service	www.moodys.com	1962	US	Bonds (sovereigns, corporation pooled investment vehicles, structu finance, public utility); bank depos

Rating Agency	Internet site	Current Form	Head Office	Type of claim
Neufeld's Credit Information AB	www.neufelds.se		Sweden (Stockholm)	Public and private companies
R@S Rating Services AG	www.rating-services.de	1999	Germany (Munich)	Small and medium-sized corporatic
Standard & Poor's	www.standardandpoors.com	1941	US	Bond from corporations, financial finance, insurance, managed sovereigns, structured finance
SVEA Kredit-Information AB	www.sveaekonomi.se			Public and private companies
SVEFO Sverige AB	www.svefo.se			Public and private companies
Thomson Financial Bankwatch	www.bankwatch.com	1974	US	Debt issues of banks and securities
Unternehmensratingagentur AG (URA)	www.ura.de			Small and medium-sized corporatic
Upplysningscentralen AB (UC AB)	www.uc.se			Public and private companies
MERGED AGENCIES				
Duff & Phelps Credit Rating Co.	*www.dcrco.com*	*1932*	*US*	*Fixed income issues (corporate finance)*
Fitch IBCA	*www.fitchibca.com*	*1997*	*France*	*Debt and preferred stock of governments, structured financing*
Fitch (2000)	*www.fitchibca.com*	*2000*	*France & UK*	*Debt and preferred stock of governments, structured financing*
OUTSIDE G10				
Rating Agency Malaysia Berhad (RAM)	*www.ram.com.my*	*1990*	*Malaysia*	*Corporates, financial institutions*
Capital Intelligence	*www.ciratings.com*	*1982*	*Cyprus*	*Banks*

Notes

1. For the purposes of this study, where identifiable, ratings available only by subscription are in the public superscript "bs".

2. Supervisory accreditation ("Sup Acc") indicates at least one national supervisor recognises and uses the rating supervisory process.

Annex III – Rating Agencies: Notes

Acknowledgements

Some of the material contained in the notes below has been taken *directly* from the Internet site of t quarter of 1999 or from publicly available documents - italics (generally) indicate these.

A.M. Best Co.

1. Letter-rated companies subscribe to Best's interactive approach and have satisfied Best's request meetings with management.
2. 2,600 property/casualty companies; 1,700 life/health companies; 1,100 foreign insurers (Canadian op 110 life insurance companies).

Bonniers Kreditfakta I Norden AB

1. Instantia has developed the basic credit rating model "KreditRådet" that is applied to the databases ma rating for a given company. In addition, Instantia also makes manual analyses on request, which Instantia and KreditFakta use the same baseline model to compute rating and suggested upper limit.
2. Calculation of maximum limit implies that EL is also considered.
3. Fee is for access to single rating.

Canadian Bond Rating Service

1. International companies accessing the markets in North America as well as subsidiaries of multi-nationa

Credit Safe AB

1. Swedish language Internet site.
2. Fee is for access to single rating.

Dominion Bond Rating Service

1. "*DBRS ratings do not take factors such as pricing or market risk into consideration and are expected their investment process. Every DBRS rating is based on quantitative and qualitative consideration entity*".
2. " *"High" and "low" grades are used to indicate the relative standing of a credit within a particular r designations indicates a rating that is essentially in the middle of the category. Note that "high" and or D categories*".

Dun & Bradstreet

1. 80% of revenues/profits from US, remainder growing quickly.
2. In Sweden calculation of maximum limit implies that EL is also considered.
3. Fee in Sweden (USD 64) is for access to single rating.

Euro Ratings AG

1. 10 employees planned (7 analysts).

Instantia Creditsystem AB International

1. Instantia has developed the basic credit rating model "KreditRådet" that is applied to the databases ma rating for a given company. In addition, Instantia also makes manual analyses on request, which Instantia and KreditFakta use the same baseline model to compute rating and suggested upper limit.
2. Determination of maximum limit implies that EL is also calculated.
3. Fee is for access to single rating.

Italrating Dcr Spa

1. Capital of Lit. 516 million fully paid-up. An increase to Lit. 2.1 billion (USD 1.1 mn) has been decide
2. "*The Agency's corporate objective … is "the assessment of credit worthiness of companies, institutio of their debt obligations*".
3. "*In December 1997 ITALRATING signed an agreement with Duff & Phelps Credit Rating Co. (DCR the SEC (Securities and Exchange Commission) as an N.R.S.R.O. (Nationally Recognised Statist* ***January 4th, 1999, as a consequence of the introduction of the Euro, all the ratings assigned are in***

Japan Credit Rating Agency, Ltd (JCR)

1. "*A 'p' rating is based mainly on an analysis of public information and is given to entities that have shown with a 'p' subscript. A 'p' rating is not modified by a plus (+) or a minus (-) sign which ind category.*"
2. "*JCR's long-term ratings are gradings that enable comparisons to be made of obligors' capacity to obligations of more than one year as contracted*."
3. 600 foreign and domestic issuers.

Japan Rating And Investment Information, Inc. (R&I)

1. R&I has achieved 87% coverage of the long-term bonds issued by Japanese companies (out of a tot commercial paper issuers (out of a total of 300), as well as rating 125 overseas entities, and R&I's among investors in the Japanese and overseas markets. Non-resident entities rated include national g

business corporations, and ratings have been assigned to US issuers such as GMAC and Merrill Lynch Kong, and other Asian countries as well as European, South American and other issuers.

2. "*'op' ratings are mainly determined on the basis of publicly disclosed information and therefore differ the relevant company, for which on-site surveys have been conducted and extra data has been exar rating to show the difference between the two types of rating*. "
3. "*A rating may be suspended if it becomes impossible to make an appropriate rating assessment due to in the operational environment, lack of data or information, or other reasons*."

KMV Corporation

1. Based upon publicly available data.
2. 9,400 firms within US (25,000 firms, globally).
3. Approximately 70 subscribers.

Lace Financial Corp.

1. Internet site indicates that they rate " *25,000 financial institutions ... and serve 700 clients* ".

Mikuni & Co

1. Japanese corporations only - 1,476 corporates, 113 banks (as of June 1999) in 90 different industries.
2. Subscription is for access to quarterly rating reports.

Moody's Investors Service

1. Unsolicited Ratings: as indicated in the note " *Designation Of Unsolicited Ratings In Which The Is* 1999), Moody's are now to designate unsolicited ratings in the rating assignment press release, v *misperception has persisted that our unsolicited ratings are assigned without the benefit of issuer par of cases issuers have in fact participated in the assignment process*."
2. Ratings Assigned: "*Moody's applies numerical modifiers 1, 2 and 3 in each generic rating category f sectors, and from Aa to B in the public finance sectors. The modifier 1 indicates that the issuer i category; the modifier 2 indicates a mid-range ranking; the modifier 3 indicates that the issuer is category."*
3. PD vs EL: "*It is important to note that Moody's long-term ratings measure total expected credit los words, they are an assessment of both (a) the likelihood that the issuer will default (i.e. miss paymen loss after a default occurs. … Note that Moody's is one of few major rating agencies using this total ex*
4. Ratings are qualitative (i.e. appraises issuers' ability to cover their debts obligations throughout the ec a statistical relationship with historical statistics of defaults and may be used to approximate average pr

Standard & Poor's

1. Additional fees through investors' subscriptions to databases.
2. *"Ratings with a 'pi' subscript are based on an analysis of an issuer's published financial information, public domain. They do not, however, reflect in-depth meetings with an issuer's management or incor and are therefore based on less comprehensive information than ratings without a 'pi' subscript. Ra annually based on a new year's financial statements, but may be reviewed on an interim basis if a credit quality occurs. Ratings with a 'pi' subscript are not modified with a '+' or '-' designations. Ou with a 'pi' subscript, nor will they be subject to potential CreditWatch listings."*
3. Cycle of 3 to 5 yrs, worst case taken.

SVEA Kredit-Information AB

1. Determination of maximum limit implies that EL is also calculated.
2. Fee is for access to single rating.

SVEFO Sverige AB

1. Determination of maximum limit implies that EL is also calculated.
2. Fee is for access to single rating.

Thomson Financial Bankwatch

1. United States - 200, Developed Markets (non-US) - 220, Latin and Central America - 125, Asia - 4 Middle East, Mediterranean and other – 65.
2. Information and newspaper publishing group.
3. 3,000 institutional subscribers.

Unternehmensratingagentur AG (Ura)

1. German language Internet site.

Upplysningscentralen AB (Uc AB)

1. Grade 1 PD > 26%, grade 5 PD < 1%.
2. Determination of maximum limit implies that EL is also calculated.
3. Fee is for access to single rating.

Merged agencies

Duff & Phelps Credit Rating Co. (March 2000 – to merge with Fitch IBCA)

1. Became independent in 1994. Offices in 36 countries, transactions in over 50 countries, over 100,000 t of ratings world-wide. Specialise in structured finance ratings (often used as a first or second rating), fo third rating where there is a Moody's/S&P split. Market leader in rating Latin American local debt issue 64% Chile, 77% Costa Rica, 45% Mexico, 75% Peru, 100% Colombia, 70% Venezuela.
2. Do not engage in unsolicited ratings, save only for some sovereign borrowers (although currently anal borrowers).
3. Cycle of 3 to 5 years, worst case taken.

Fitch IBCA

1. Ownership: Merger of Fitch and IBCA in 1997.
2. Defaulted Ratings – DDD, DD, D: "*the ratings of obligations in this category are based on their recovery in a reorganisation or liquidation of the obligor. While expected recovery values are high with any precision, the following serve as general guidelines. 'DDD' obligations have the highest po of outstanding amounts and accrued interest. 'DD' indicates potential recoveries in the range of potential, i.e. below 50%.*"

Fitch (2000)

1. Revenues of USD 260 million, wholly owned by FIMALAC, S.A., Paris.

Outside G10

Rating Agency Malaysia (RAM)

1. Owned by commercial, merchant banks, finance companies, Asian Development Bank, Fitch IBCA.
2. "*RAM applies the suffix (bg) or (s) to ratings that have been enhanced by a bank guarantee or oth addition, for Long Term Ratings, RAM applies subscripts 1, 2 or 3 in each rating category from AA issue ranks in the higher end of its generic rating category; the subscript 2 indicates a mid-ranking issue ranks in the lower end of its generic rating category*".

Capital Intelligence

1. "*Rating Reports are either edited versions of the Bank Reports as described above or shorter credit* *an institution's ratings, an appraisal of its positive and negative factors, a summary financial ana* *institution's financial performance and condition, as well as its prospects. Spreadsheets and ratio* *operating results are included. Rating Assessments are similar products to rating reports but are* *information, and their publication does not necessarily imply that CI has met with the institution's m* *apply the same analytical methodology as generally used by CI and although the same rating scal* *Assessments are written in the lower case, e.g. bb+/a-2. Spreadsheets and ratios covering the most* *included*".
2. Head office Cyprus, branch office Hong Kong, representative office in Dubai. Gulf/Mediterranean - Asia/Pacific region - nearly 180 banks in fourteen countries. In recognition of the changing profiles o Gulf/Mediterranean and the Asia/Pacific regions, CI regularly introduces new banks and countries to its European - over 60. (Bahrain, Lithuania, South Africa, China, Macau, South Korea, Cyprus, Malaysia, Taiwan, Egypt, Oman, Thailand, Greece, Pakistan, Tunisia, Hong Kong, Philippines, Turkey, Hungary, Indonesia, Romania, Jordan, Saudi Arabia, Kuwait, Singapore, Latvia, Slovakia, Lebanon, Slovenia).

Annex IV.A - Issuer Ratings by Agency and Geographi
(Sovereigns, Banks, Industrials & Corporates)

ABSOLUTE NUMBERS

Banks	DCR	Fitch	Moody's	S&P	Total	Inds/Corps	DCR	Fitch	Moody's	S&P	Total	Sovereig
United States	120	170	668	320	757	United States	434	245	2,645	2,224	3,297	United S
Europe, Middle East, Africa	73	308	596	338	862	Europe, Middle East, Africa	138	92	362	370	520	Europe, East, Afri
Asia	3	35	248	60	274	Asia	8	3	286	94	318	Asia
Latin America	52	38	148	45	175	Latin America	85	11	109	164	215	Latin Am
Total - by agency	248	551	1,660	763	2,068	Total - by agency	665	351	3,402	2,852	4,350	Total - by

COVERAGE (%)

Banks	DCR	Fitch	Moody's	S&P	Inds/Corps	DCR	Fitch	Moody's	S&P	Sovereig
United States	16	22	88	42	United States	13	7	80	67	United S
Europe, Middle East, Africa	8	36	69	39	Europe, Middle East, Africa	27	18	70	71	Europe, East, Afri
Asia	1	13	91	22	Asia	3	1	90	30	Asia
Latin America	30	22	85	26	Latin America	40	5	51	76	Latin Am
By agency	12	27	80	37	By agency	15	8	78	66	

Source: Duff & Phelps/FT Credit Ratings (January 2000)

Notes

1. "n/a" signifies that the absolute figures were not available, or that calculation of the coverage parameter is not appropriate.
2. Figures in total columns for banks and industrials/corporates give number of rated institutions in each geographic region and overall.
3. Due to the difficulty in obtaining consistent statistics relating to the total number of entities eligible to seek a rating across membe calculated as being the proportion of institutions rated by an agency relative to the total rated population (defined as being the set of ent above); under these conditions, "coverage" is not an absolute indicator of the "reach" of a rating agency.

Annex IV.B - Issuer Ratings by Agency and Geographi
(Sub-Sovereigns, Insurance, Structured Financ

ABSOLUTE NUMBERS

Sub-sovereigns	DCR	Fitch	Moody's	S&P	Insurance	DCR	Fitch	Moody's	S&P	Struc Finance
United States	109	n/a	n/a	n/a	United States	427	0	495	2,091	United States
Europe, Middle East, Africa	8	36	76	86	Europe, Middle East, Africa	14	10	92	476	Europe, Middl East, Africa
Asia	0	0	1	0	Asia	0	0	17	43	Asia
Latin America	10	2	10	7	Latin America	4	0	0	20	Latin America
					Total - by agency	445	10	604	2,630	Total - by age

COVERAGE (%)

Sub-sovereigns	DCR	Fitch	Moody's	S&P	Insurance	DCR	Fitch	Moody's	S&P	Struc Finance
United States	n/a	n/a	n/a	n/a	United States	n/a	n/a	n/a	n/a	United States
Europe, Middle East, Africa	n/a	n/a	n/a	n/a	Europe, Middle East, Africa	n/a	n/a	n/a	n/a	Europe, Middl East, Africa
Asia	n/a	n/a	n/a	n/a	Asia	n/a	n/a	n/a	n/a	Asia
Latin America	n/a	n/a	n/a	n/a	Latin America	n/a	n/a	n/a	n/a	Latin America
										By agency

Source: Duff & Phelps/FT Credit Ratings (January 2000)

Notes

1."n/a" indicates absolute figures were not available, or that calculation of the coverage parameter is not appropriate. 2. For insurance firms, r of a company's ability to pay out their insurance claims rather than the likelihood of them defaulting on the repayment of issued debt. 3. For S 1997 to 1999 only, whereas for the other areas the figures are for all transactions. (The relative youth of the other markets, however, means t be undertaken). 4. Due to the difficulty in obtaining consistent statistics relating to the total number of entities eligible to seek a rating "coverage" is calculated as being the proportion of institutions rated by an agency relative to the total rated population (defined as being the agencies above); under these conditions, "coverage" is not an absolute indicator of the "reach" of a rating agency.

Annex IV.C - Bank Ratings by Agency and Country (Europe, Middle East, Africa, Asia, Latin America)

BANKS

	DCR	Fitch	Moody's	S&P
Europe				
Austria	0	2	44	4
Belgium	0	6	12	6
Channel Islands	0	1	0	0
Croatia	0	2	1	1
Czech Republic	4	3	6	5
Denmark	0	3	6	1
Estonia	0	1	3	0
Finland	0	4	12	3
France	0	39	101	110
Germany	1	39	62	38
Gibraltar	0	1	0	1
Greece	0	4	10	5
Guernsey	0	0	1	1
Hungary	0	2	7	0
Iceland	0	0	3	0
Ireland	0	6	11	6
Italy	12	30	35	31
Kazakhstan	0	1	3	2
Lichtenstein	0	0	1	1
Lithuania	0	2	0	0
Luxembourg	0	4	16	7
Malta	0	2	2	0
Netherlands	3	10	18	15
Norway	0	6	11	1
Poland	0	6	10	1
Portugal	0	13	11	9
Russia	0	8	12	7
Spain	0	49	28	17
Slovakia	0	0	2	1
Slovenia	0	6	5	3
Sweden	0	7	12	11
Switzerland	1	4	17	5
Turkey	20	4	17	5
UK	2	33	64	28
Total	*43*	*298*	*543*	*325*

	DCR	Fitch	Moody's	S&P
Middle East				
Egypt	2	4	7	2
Israel	0	0	5	2
Jordan	0	0	3	0
Kuwait	0	4	7	2
Lebanon	0	2	4	3
Saudi Arabia	0	0	10	0
UAE	0	0	3	0
Total	*2*	*10*	*39*	*9*
Africa				
Kenya	1	0	0	0
Nigeria	3	0	0	0
South Africa	16	0	6	3
Tunisia	0	0	8	1
Zimbabwe	8	0	0	0
Total	*28*	*0*	*14*	*4*
Total EMEA	***73***	***308***	***596***	***338***
Asia				
China	0	0	27	5
Hong Kong	0	6	31	2
India	0	0	9	2
Indonesia	2	0	13	6
Japan	0	18	76	26
Korea	1	3	36	7
Malaysia	0	0	7	2
Philippines	0	0	8	2
Singapore	0	0	11	1
Taiwan	0	1	15	7
Thailand	0	7	15	5
Total Asia	***3***	***35***	***248***	***65***
Latin America				
Argentina	7	5	24	7
Bolivia	1	0	1	3
Brazil	3	14	64	8
Chile	9	4	16	7
Colombia	5	1	8	1
Costa Rica	1	0	0	0
Dominican Republic	1	0	0	0
Ecuador	0	0	2	0
El Salvador	4	0	0	0
Mexico	9	5	14	11
Panama	3	1	3	2
Peru	2	0	4	0
Puerto Rico	4	0	3	3
Uruguay	0	0	2	1
Venezuela	3	8	7	2
Total Lat America	***52***	***38***	***148***	***45***

Source: Duff & Phelps/FT Credit Ratings (January 2000)

Annex IV.D - Industrials/Corporates Ratings by Agency and Country (Europe, Middle East, Africa, Asia, Latin America)

INDUSTRIALS / CORPORATES

	DCR	Fitch	Moody's	S&P
Europe				
Austria	0	0	2	4
Belgium	0	0	6	4
Cyprus	0	0	1	1
Czech Republic	3	0	0	5
Denmark	0	0	2	1
Finland	0	0	9	8
France	4	6	26	37
Germany	1	1	18	18
Greece	1	0	10	8
Hungary	1	0	0	1
Iceland	1	0	1	2
Ireland	1	1	4	3
Isle of Man	0	0	1	1
Italy	27	0	1	4
Lithuania	0	1	1	1
Luxembourg	0	0	2	2
Malta	0	0	1	2
Netherlands	2	1	56	39
Norway	1	0	9	11
Poland	3	1	2	3
Portugal	0	0	2	3
Russia	0	0	2	6
Slovenia	0	0	1	2
Spain	3	7	13	12
Sweden	2	1	21	19
Switzerland	0	0	11	13
Turkey	13	0	0	0
UK	26	72	155	147
Total	*89*	*91*	*357*	*357*

	DCR	Fitch	Moody's	S&P
Middle East				
Egypt	8	1	0	1
Israel	0	0	3	7
Jordan	1	0	0	0
Total	*9*	*1*	*3*	*8*
Africa				
South Africa	40	0	2	5
Total	*40*	*0*	*2*	*5*
Total EMEA	***138***	***92***	***362***	***370***
Asia				
China	1	0	0	0
Hong Kong	0	1	12	20
India	0	0	3	6
Indonesia	2	0	3	8
Japan	2	2	254	40
Malaysia	1	0	2	4
Philippines	2	0	6	8
Singapore	0	0	0	1
Taiwan	0	0	0	1
Thailand	0	0	6	6
Total Asia	***8***	***3***	***286***	***94***
Latin America				
Argentina	7	4	23	37
Brazil	16	1	15	33
Chile	26	1	18	25
Colombia	8	0	13	6
Costa Rica	1	0	0	0
Dominican Republic	1	0	1	1
El Salvador	2	0	1	2
Mexico	17	1	30	53
Panama	3	0	3	2
Peru	2	0	0	0
Puerto Rico	1	0	2	2
Venezuela	1	4	3	3
Total Lat America	***85***	***11***	***109***	***164***

Source: Duff & Phelps/FT Credit Ratings (January 2000)

Annex IV.E - Banks and Industrials/Corporates Ratings by Agency and Country (by G10 and non-G10 countries)

BANKS

G10	DCR	Fitch	Moody's	S&P
United States	120	170	668	320
France	0	39	101	110
Germany	1	39	62	38
Italy	12	30	35	31
United Kingdom	2	33	64	28
Japan	0	18	76	26
Netherlands	3	10	18	15
Sweden	0	7	12	11
Luxembourg	0	4	16	7
Belgium	0	6	12	6
Switzerland	1	4	17	5
G10 - Total	***139***	***360***	***1,081***	***597***
Non-G10				
Argentina	7	5	24	7
Austria	0	2	44	4
Bolivia	1	0	1	3
Brazil	3	14	64	8
Channel Islands	0	1	0	0
Chile	9	4	16	7
China	0	0	27	5
Colombia	5	1	8	1
Costa Rica	1	0	0	0
Croatia	0	2	1	1
Czech Republic	4	3	6	5
Denmark	0	3	6	1
Dominican Republic	1	0	0	0
Ecuador	0	0	2	0
Egypt	2	4	7	2
El Salvador	4	0	0	0
Estonia	0	1	3	0
Finland	0	4	12	3
Gibraltar	0	1	0	1
Greece	0	4	10	5
Guernsey	0	0	1	1
Hong Kong	0	6	31	2
Hungary	0	2	7	0
Iceland	0	0	3	0
India	0	0	9	2
Indonesia	2	0	13	6
Ireland	0	6	11	6
Israel	0	0	5	2
Jordan	0	0	3	0
Kazakhstan	0	1	3	2
Kenya	1	0	0	0
Korea	1	3	36	7
Kuwait	0	4	7	2
Lebanon	0	2	4	3
Lichtenstein	0	0	1	1
Lithuania	0	2	0	0
Malaysia	0	0	7	2
Malta	0	2	2	0
Mexico	9	5	14	11
Nigeria	3	0	0	0
Norway	0	6	11	1
Panama	3	1	3	2
Peru	2	0	4	0
Philippines	0	0	8	2
Poland	0	6	10	1
Portugal	0	13	11	9
Puerto Rico	4	0	3	3
Russia	0	8	12	7
Saudi Arabia	0	0	10	0
Singapore	0	0	11	1
Slovakia	0	0	2	1
Slovenia	0	6	5	3
South Africa	16	0	6	3
Spain	0	49	28	17
Taiwan	0	1	15	7
Thailand	0	7	15	5
Tunisia	0	0	8	1
Turkey	20	4	17	5
UAE	0	0	3	0
Uruguay	0	0	2	1
Venezuela	3	8	7	2
Zimbabwe	8	0	0	0
Non G10 - Total	***109***	***191***	***579***	***171***

INDUSTRIALS / CORPORATES

G10	DCR	Fitch	Moody's	S&P
United States	434	245	2,645	2,224
United Kingdom	26	72	155	147
Japan	2	2	254	40
Netherlands	2	1	56	39
France	4	6	26	37
Sweden	2	1	21	19
Germany	1	1	18	18
Switzerland	0	0	11	13
Belgium	0	0	6	4
Italy	27	0	1	4
Luxembourg	0	0	2	2
G10 - Total	***498***	***328***	***3,195***	***2,547***
Non-G10				
Argentina	7	4	23	37
Austria	0	0	2	4
Brazil	16	1	15	33
Chile	26	1	18	25
China	1	0	0	0
Colombia	8	0	13	6
Costa Rica	1	0	0	0
Cyprus	0	0	1	1
Czech Republic	3	0	0	5
Denmark	0	0	2	1
Dominican Republic	1	0	1	1
Egypt	8	1	0	1
El Salvador	2	0	1	2
Finland	0	0	9	8
Greece	1	0	10	8
Hong Kong	0	1	12	20
Hungary	1	0	0	1
Iceland	1	0	1	2
India	0	0	3	6
Indonesia	2	0	3	8
Ireland	1	1	4	3
Isle of Man	0	0	1	1
Israel	0	0	3	7
Jordan	1	0	0	0
Lithuania	0	1	1	1
Malaysia	1	0	2	4
Malta	0	0	1	2
Mexico	17	1	30	53
Norway	1	0	9	11
Panama	3	0	3	2
Peru	2	0	0	0
Philippines	2	0	6	8
Poland	3	1	2	3
Portugal	0	0	2	3
Puerto Rico	1	0	2	2
Russia	0	0	2	6
Singapore	0	0	0	1
Slovenia	0	0	1	2
South Africa	40	0	2	5
Spain	3	7	13	12
Taiwan	0	0	0	1
Thailand	0	0	6	6
Turkey	13	0	0	0
Venezuela	1	4	3	3
Non G10 - Total	***167***	***23***	***207***	***305***

Source: Duff & Phelps/FT Credit Ratings (January 2000)

Note

1. The figures for Canada are excluded from the numbers for the G10 countries

Annex IV.F - European Entities Rated by Moody's (by Country, Rat

Country	Governments					Banks					Insurers				
	Aa	A	Baa	B	Sub-total	Aa	A	Baa	B	Sub-total	Aa	A	Baa	B	Sub-total
Austria	2				2	6	5			11					0
Belgium	3				3	6				6					0
Denmark	4				4	4	3			7	1	2			3
Finland	1				1	3	1			4	3				3
France	9	1			10	14	7	3		24		1			1
Germany	3				3	29	7			36	9	1			10
Ireland	1				1	3	3	1	1	8					0
Italy	8	1			9		20	4		24	1				1
Luxembourg	1				1	3		1		4					0
Netherlands	1				1	5		1		6	2				2
Norway	1				1	2	3	2	1	8		1			1
Portugal	2	1			3	1	4			5					0
Spain	7	3			10	8	12			20					0
Sweden	3	1			4	4	4			8	1	2			3
Switzerland	1				1		3			3		2			2
UK	1				1	9	20	4		33	15	8	1		24
Total - Europe	**48**	**7**	**0**	**0**	**55**	**0**	**97**	**92**	**16**	**2**	**207**	**32**	**17**	**1**	**0**	**50**

Source: Moody's and Salomon Smith Barney ("Capital Matters - The New BIS Capital Adequacy Framework" - 16 June 1999)

Notes

1. "Entities" includes groups with multiple rated subsidiaries only once.
2. "Aa" includes Aaa, Aa1, Aa2, Aa3; "A" includes A1, A2, A3; "Baa" includes Baa1, Baa2, Baa3; "B" includes

Annex IV.G - Banks, Industrials, Corporate Ratings by Agency and Cour (by G10 and selected non-G10 countries)

BANKS, INDUSTRIALS, CORPORATES					No. Firms	No. Firms
G10	**DCR**	**Fitch**	**Moody's**	**S&P**	**>= $10M**	**>= $50M**
United States	554	415	3,313	2,544	155,500	37,826
France	26	111	256	257	26,309	5,581
Germany	3	41	316	78	42,851	9,700
Italy	14	31	91	70	20,372	3,497
United Kingdom	6	39	90	65	27,329	8,547
Japan	2	19	97	45	86,409	22,015
Netherlands	4	11	36	33	3,831	1,851
Sweden	-	7	23	24	5,214	1,105
Luxembourg	-	4	22	11	230	83
Belgium	27	6	13	10	6,008	1,354
Switzerland	1	4	19	7	4,413	1,358
Canada	n/a	n/a	n/a	n/a	14,172	3,325
Non-G10 (Selected)						
Argentina	14	9	47	44	3,141	638
Austria	-	2	46	8	3,751	1,081
Chile	29	15	82	33	304	158
Korea	1	3	36	7	789	488
Spain	3	56	41	29	10,634	1,958

Source: Duff & Phelps/FT Credit Ratings (January 2000)

Dun & Bradstreet (March 2000)

Notes

1. The "number" of businesses in each country is defined as those entities that have **turnover** equal to or greater than the figure indicated an (Number of companies by assets size across the G10 countries was unavailable.) 2. No "one-to-one" correspondence exists between the num and the number of firms having a given turnover in the right-hand section. 3. The figures are intended only to give order of magnitude estim countries. 4. Figures for the number of firms in Canada are included for comparison. (The number of rated firms in Canada was not available.)

Section D. Regulatory Certification Procedures

Introduction

This section summarises the results of a survey into the current use of credit rating agencies' ratings in financial regulation, particularly banking supervision, across eighteen countries. [12] Participants were asked for information on how ratings were used in their countries' regulations, which agencies' ratings were eligible for use (and how this had changed over time), the recognition criteria used by the supervisory authorities and whether the authorities carried out ongoing monitoring of agencies' performance. They were also asked for information on how their supervisory authorities treated split and unsolicited ratings.

The countries selected were the twelve members of the Basel Committee on Banking Supervision (BCBS) and six interesting non-members: Australia, Argentina, Chile, Hong Kong, Mexico and New Zealand. The latter were selected on the basis of fulfilling one or more of the following criteria: having an innovative approach to financial regulation; a relatively recent experience of financial instability; a known interesting use of credit ratings in their regulations and/or their general importance to the world financial system. Responses were received from all eighteen countries.

In any survey there is the potential problem of respondents interpreting the questions in different ways. It is an issue here because some respondents' replies pertain to just the prudential regulation of banks, while others refer to all forms of financial regulation in their country. For the sake of comparability (and also because the motivation behind this study is the reform of the 1988 Basel Accord) the discussion in the text refers to just the regulation of banks. Where respondents have provided information on the use of ratings in the regulation of other types of financial firms, that information is included in the tables, but it is not actively discussed.

The survey questions and answers are summarised in the following separate sections. Information on BCBS-member countries is presented first, followed by information on the six other countries.

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Do the financial regulatory authorities in your country use rating agencies' ratings in regulation? If so, please indicate the particular regulation.

Table 1 summarises how credit rating agencies' ratings are currently used in the financial regulation undertaken in the countries polled. It is evident that ratings are used in eleven out of the twelve BCBS-member countries. The exception is Germany. Of the six non-members, five use ratings in their financial regulation, but Mexico does not.

Seven out of the eleven BCBS members that use ratings in their prudential supervision of banks do so solely to determine what is a qualifying debt security or other interest rate related instrument for the calculation of the capital requirement for specific interest rate risk. This is set out in the standardised methodology of the market risk amendment to the original Basel Accord. For the members of the EU/EEA, this is encapsulated in the Capital Adequacy Directive (CAD)[13]. Member countries are allowed to waive this part of the CAD, if they "judge it inappropriate in the light of, for example, the characteristics of the market, the issuer, the issue, or some combination of those characteristics". It is this waiver which Germany opts to exercise. Two out of the six non-member countries (Australia and Hong Kong) also use ratings to judge a qualifying debt security for market risk.

Only four BCBS members use agencies' ratings in their prudential regulation of banks for purposes other than market risk. In Belgium, banks are required to provide information on the composition of parts of their securities portfolio, split by rating. In Switzerland, ratings are used in the definition of the risk weights for credit risk, where the appropriate weight depends on the counterparty's location. The definition of what constitutes an OECD country has an additional criterion, which excludes countries with a lower-than-investment-grade rating (by a recognised agency) on their long-term foreign currency liabilities or where they are unrated, their yield to maturity and remaining duration are not comparable with those of long-term liabilities with an investment grade rating. In the United Kingdom, those banks using the mismatch approach to liquidity monitoring are able to insert "marketable assets" in an earlier time band (at a discount to their recorded value) rather than the one that corresponds to their latest contractual maturity. The definition of a marketable asset uses the same criteria for qualifying items as is used in the CAD.

[13] The CAD applies to both credit institutions and investment firms.

Table 1: Use of rating agencies' ratings in financial regulation

Country	Details of the regulation
BCBS Members	
Belgium	• CAD/Market risk amendment. • Prudential reporting: the descriptive tables relating to the composition of a bank's securities portfolio require information on securities' ratings and the agencies which issued the ratings.
Canada	Market risk amendment
France	CAD/Market risk amendment
Germany	No
Italy	CAD/Market risk amendment
Japan	Market risk amendment
Luxembourg	CAD/Market risk amendment
Netherlands	CAD/Market risk amendment
Sweden	CAD/Market risk amendment
Switzerland	• Market risk amendment. • Credit risk: some risk-weights depend on whether the counterparty is located within an OECD country. Where OECD countries are defined as full members of the OECD, or countries that have concluded special credit agreements with the IMF in connection with the General Agreements on Credit of the latter, excluding those which have re-scheduled their external debts during the previous 5 years, or have a lower rating than investment grade on its long-term foreign currency debt (where it has no rating, its yield to maturity and remaining duration must not be incomparable with those of long-term liabilities with investment grade ratings). • Investment funds: fund managers are restricted with whom they may conclude certain derivative transactions, dependent on the counterparty's credit rating.
UK	• CAD/Market risk amendment. • Liquidity reporting guidelines for non-clearing banks.
USA	See Table 6 in Appendix 1 (p. 55)
Six non-members of the BCBS	
Argentina	• Banks and financial companies must seek a rating from an authorised rating agency. The rating reflects the ability of the financial institution to repay its medium- and long-term liabilities. Although the rating scales are identical to those used by international rating agencies, the ratings do not encompass the country risk analysis. In the case of branches of foreign banks or subsidiaries wholly owned by foreign banks whose headquarters guarantee the obligations of their subsidiaries irrevocably, there is an alternative rating system. Financial institutions must provide copies of the reports to customers who request them free of charge. However, they cannot be used in advertising campaigns or printed documents. • The central bank prepares a list of banks that can receive time deposits from institutional investors (pension funds). Banks with weak ratings are excluded from this list. • The Comision Nacional de Valores (CNV), the stock-market watchdog, does not extend authorisation for the public offer of a security unless its issuer has sought two ratings. In addition, pension funds are not allowed to invest in assets that do not exceed a certain rating threshold, which is set at BBB for domestic credit ratings and B for ratings issued by international agencies on securities of resident issuers. • The same provisions are extended to the insurance industry. In this case, the insurance industry is being asked to invest in rated securities with a minimum rating, and also asked to seek a rating as policies issued by them increasingly are being sold to pension funds.

Australia	• Prudential Statement C3 – Capital Adequacy for Banks, ratings are used to determine the capital requirement for specific risk for interest rate risk in the trading book. • Prudential Statement C1 – Recognises mortgage insurance (as part of loan to valuation calculations) for risk-weighting loans secured by residential mortgages where the lenders' mortgage insurer carries a credit rating of A or higher from an approved credit rating agency. • Prudential Statement C2 – Covers securitisation and funds management, and also makes references to credit ratings (for example, in determining the adequacy of credit enhancements provided to securitisation schemes).
Chile	• Companies that issue equities in ADRs must have a minimum rating. • Chilean institutions are only permitted to invest in overseas securities that have a minimum rating.
Hong Kong	• Liquidity regime: authorised institutions' (AIs) holdings of marketable debt securities may be regarded as liquefiable assets for the calculation of the liquidity ratio if the debt securities satisfy the qualifying credit rating. The statutory minimum liquidity ratio, expressed as a percentage of liquefiable assets to qualifying liabilities, is 25% for all AIs. • Capital adequacy regime: under the market risk capital adequacy framework, debt securities in the trading book that satisfy the minimum ratings may be included in a "rated" category. Rated securities carry lower risk weightings compared with "unrated" securities. • Discount Window: three types of securities are eligible for overnight repo under the Discount Window operated by the HKMA, namely, the Exchange Fund paper, the existing Specified Instruments, and other Hong Kong dollar securities with long-term ratings higher than the minimum acceptable ratings. • Lender of last resort: in addition to the eligible paper for the Discount Window, other Hong Kong dollar securities with an investment grade rating assigned by a recognised credit rating agency are also eligible for repo transaction under the LOLR function.
Mexico	No
New Zealand	A registered bank that has a credit rating on its senior unsecured long-term New Zealand dollar debt payable in New Zealand is required to disclose that rating in its quarterly disclosure statements. The disclosures include information on the name of the rating agency, the date of rating, the nature of the ratings nomenclature used, and any changes to the rating over the previous two years. A bank that does not have a rating of the specified debt obligation also is required to disclose that fact in its quarterly disclosure statements.

The United States has a longer history of using rating agencies' ratings in financial regulation. An overview is shown in Appendix 1. In 1931, banks were required to mark to market lower rated bonds. In 1936, they were prohibited from purchasing "speculative securities". In 1994, the capital requirements on banks' holdings of different tranches of asset-backed securities were made a function of their rating. In 1999, the ability of national banks to establish financial subsidiaries was restricted based on their rating.

Three of the non-BCBS member countries use rating agencies' ratings in their prudential regulation of banks (apart from in the context of market risk). In Argentina, the central bank constructs a list of banks permitted to receive time deposits from institutional investors (pension funds) and a bank's rating is one of the factors on which the central bank bases its decision on membership. In Australia, ratings have two additional roles in determining bank's capital requirement. First, the Australian Prudential Regulation Authority (APRA) recognises mortgage insurance by insurers that have a rating of A or higher by a recognised rating agency. Second, ratings have a role in determining the adequacy of credit enhancements provided to securitisation schemes. In Hong Kong, ratings are used to determine what is a liquefiable asset in the liquidity regime.

In Argentina and New Zealand, the authorities make use of agencies' ratings of the banks (as opposed to their counterparties) in their regulation. They are used to provide information to the banks' creditors and thereby facilitate market discipline. In the former, all banks and financial institutions must obtain a rating from a recognised agency. Each bank is required to provide a copy of the associated report to any customer requesting one free of charge. In New Zealand, a registered bank is required to include in its quarterly disclosure statements information on whether it has a rating (and specific details, if it does) on its senior unsecured long-term debt denominated in New Zealand dollars payable in New Zealand. This includes both the General Disclosure Statement, which is targeted at sophisticated readers and the Key Information Statement (KIS), which is targeted at the "prudent but not expert investor". Ratings are regarded as being a particularly useful indicator of relative bank credit quality for the latter group because they are relatively easy to understand. Each bank is required to display its KIS statement and be able to make it available immediately in all its branches. It also must be displayed on its internet site.

The motivation behind the New Zealand requirements is threefold. First, it provides creditors of banks with additional information with which to assess the soundness of a bank and compare one bank with another. Second, it reinforces incentives for the prudent management of banks and is consistent with the aim of placing greater emphasis on market discipline as a means of promoting a sound bank system. Third, it assists in reducing the perception that banks are somehow underwritten by the government or central bank.

Which rating agencies are used?

Comparing the number of rating agencies each country's banking supervisor recognises is complicated because some supervisors recognise different parts of the same rating agency, while others recognise the agency in its entirety. This occurs when two agencies have

merged[14] or when there is a local subsidiary of an international agency and the international agency itself operating in the same country. It seems likely to reflect the rating agencies' varying operating structures across different countries, as much as supervisors use of different recognition policies. Regardless of the cause, it complicates the comparison.

Table 2 shows the rating agencies recognised by the banking supervisors in each of the BCBS-member countries and the selected non-members. It is constructed on a comparable basis, in that it ignores a supervisor issuing multiple recognitions to the same agency (or its various parts). The total number of agencies recognised in each country is shown in the right-hand column. It is evident there is considerable disparity in the number of recognitions granted by the supervisors in the various member countries. The United Kingdom recognises the most agencies at ten. It is followed by France[15] and the Netherlands, which each recognise nine. The banking supervisors in Luxembourg and Sweden recognise the least at three.

Analysis of the four non-BCBS members (shown in the lower half of Table 2) that recognise agencies suggests they recognise about the same number as their counterparts in the BCBS. The mean number of agencies recognised in Argentina, Australia, Chile and Hong Kong is 6. This compares to a figure of 6.3 for the eleven member countries which use ratings. However, this result is heavily dependent on the inclusion of Australia.

The rows at the end of each section (with the figures in italics) show the number of countries in which each agency is recognised. Fitch IBCA, Moody's, and S&P are recognised in all eleven member countries that use credit ratings in their banking supervision. Thereafter, Thompson Bankwatch is recognised in eight, Duff and Phelps in seven and Dominion Bond Rating Service and Japan Credit Rating Agency in five. The remainder are recognised in four or fewer countries. The dominance of the international agencies is also apparent in the non-BCBS member countries. Fitch IBCA and S&P are recognised by all four countries that grant recognition (as is Thompson Bankwatch). Moody's is recognised in three. Moody's does not have a subsidiary in Argentina, so it does not issue ratings which follow the central bank's (which is responsible for banking supervision) guidelines. However, it is recognised by the Argentine securities regulator.

[14] This was compiled prior to the announcement of the merger between Fitch IBCA and Duff & Phelps Credit Rating Co (DCR).

[15] If multiple recognitions of the same agency are permitted, France issues the most recognitions at thirteen.

Table 2: Rating agencies recognised in various countries

	Canadian Bond Rating Service (CBRS)	Dominion Bond Rating Service (DBRS)	Duff & Phelps Credit Rating Agency	Fitch IBCA[1]	Ital Rating DCR SPA	Japan Credit Rating Agency (JCR)	Japan Rating and Investment Information[1]	Mikuni & Co	Moody's Investor Service	Standard & Poors' Rating Services	Thompson Bank Watch	*Total number of rating agencies recognised*
Members of the Basel Committee on Banking Supervision												
Belgium			T	T					T	T	T	*5*
Canada	T	T		T		T			T	T		*6*
France	T	T	T	T		T	T		T	T	T	*9*
Italy			T	T	T[2]				T	T	T	*6*
Japan			T	T		T	T		T	T	T	*7*
Luxembourg				T					T	T		*3*
Netherlands	T	T	T	T		T	T		T	T	T	*9*
Sweden				T					T	T		*3*
Switzerland		T		T				T	T	T	T	*6*
UK	T[2]	T[2]	T[2]	T		T[2]	T[2]	T[2]	T	T	T[2]	*10*
USA			T	T					T	T	T	*5*
Total BCBS	*4*	*5*	*7*	*11*	*1*	*5*	*4*	*2*	*11*	*11*	*8*	*69*
Interesting non-members of the BCBS[3]												
Argentina			T	T						T	T	*4*
Australia	T[2]	T[2]	T[2]	T		T[2]	T[2]	T[2]	T	T	T[2]	*10*
Chile		T		T					T	T	T	*5*
Hong Kong				T			T		T	T	T	*5*
Total non-BCBS	*1*	*2*	*2*	*4*	*0*	*1*	*2*	*1*	*3*	*4*	*4*	*27*
Total	*5*	*7*	*9*	*16*	*1*	*6*	*6*	*3*	*15*	*16*	*12*	

[1] See comments in the text on treatment of where a country's regulator recognises more than one part of a rating agency.

[2] Indicates where the regulator stated that this agency is only recognised for a subset of issues.

[3] New Zealand is excluded as it does not recognise agencies.

The remaining noteworthy feature in Table 2 is the Australian, Swiss and the UK banking supervisors use of Mikuno & Co, a Japanese rating agency that is not recognised by the Japanese supervisors. All the other rating agencies recognised by overseas supervisors are recognised by their domestic counterparts as well.

How has the list of eligible agencies changed over time?

Table 3 shows the changes to the list of recognised rating agencies for each country since its creation. Eight of the eleven BCBS member countries that use ratings have either never made changes to their lists, or the changes reflect mergers and take-over activity between existing members of the list. The eight countries are Canada, France, Japan, Luxembourg, the Netherlands, Sweden, Switzerland, and the United Kingdom. The same is true for Argentina, Australia, and Chile when looking at the four non-BSBC member countries that recognise rating agencies.

The lack of any change to the lists of recognised agencies in these countries probably reflects their relatively recent construction. Information on their date of first construction (where supplied by the respondent) is contained in the second column of Table 3. Most were compiled in 1996 or 1997 to implement either the CAD or the market risk amendment.

Where the regulatory authorities have altered their lists of recognised agencies, their main action has been to add new agencies. In Belgium and Italy, two agencies were added. In the United States, four agencies have been added. In Hong Kong, three additional agencies have been recognised. Where deletions have occurred they did so for reasons of merger and take-over of one recognised agency by another. No respondent from a BCBS member country reported a case where an agency was removed from its list for another reason, such as incompetence. Likewise, none of the respondents from non-members of the BCBS report such an exclusion, although the Argentinean reply cited one exclusion by their stock exchange regulators, no explanation for the move was given.

The absence of deletions for reasons other than take-over or merger is of interest. Without greater knowledge it is not possible to know whether this reflects the consistently high quality of the recognised rating agencies or the lack of monitoring by the regulatory authorities. The latter or alternatives to it (such as regularly repeated surveys of which agencies market participants use) would seem a pre-requisite for forced deletions.

Table 3: Alterations to regulators' list of recognised rating agencies

Country	List first created	Subsequent changes to list
BCBS members		
Belgium	June 1996	Agencies initially recognised were Moody's Investor Service, Standard & Poor's Corporation, IBCA Ltd and Thomson Bankwatch. The following were added to the list: Fitch Investors Services LP and Duff & Phelps Credit Rating Company.
Canada	November 1997	No change
France	1995	No change
Italy	1996	List first published in 1996 contained ItalRating DCR Spa, Moody's Investor Services, Standard and Poors and Fitch Investors Service - IBCA. In 1999, Duff & Phelps Credit Rating Co and Thomson Bankwatch, Inc were added.
Japan	1997	No change except for mergers between agencies
Luxembourg	Since implementation of the CAD	No change
Netherlands	1996	No change
Sweden	1 January 1996	No change
Switzerland	1997	No change
UK	1995	No change except mergers/take-overs
USA	1975	When the term NRSRO was initially adopted in 1975, three agencies were recognised: Moody's Investor Service, Standard & Poors and Fitch Investor Services. In 1982, Duff and Phelps was added. In 1983, McCarthy, Crisanti & Maffei was added. In 1991, IBCA was added, and in 1992, Thomson Bankwatch was added. In 1991, Duff & Phelps acquired the rating franchise of McCarthy, Crisanti & Maffei in 1991, so this was deleted. In November 1997, Fitch IBCA merged, so IBCA no longer has NRSRO status.
Non-members of the BCBS		
Argentina	Mid 1997	No change to the central bank registry. The CNV registry opened in 1992, since then, one company has been excluded and two taken over by their foreign shareholders.
Australia	January 1997	No change
Chile	N/A	No change
Hong Kong	1994	In 1994, Moody's and S&P first recognised for the Liquidity Regime and the Liquidity Adjustment Facility. In 1996, IBCA, Thomson Bankwatch and the Japan Bond Research Institute (which became the Japan Rating and Investment Information Inc) were added to the list. In 1997, the five were accepted for the reporting of market risk, in 1998 for assessing the eligibility of debt securities for Discount Window, and in 1999 for the lender of last resort function.
New Zealand	N/A	Not applicable

What are the criteria for eligible agencies?

Table 4 shows the criteria used by banking supervisors in the various countries to recognise rating agencies. The original wording from their replies [16] has been kept to avoid any possible misrepresentation. The existing national recognition criteria are compared with those proposed for eligible external credit-assessment institutions contained within the consultative paper. At the outset, it should be said that this comparison should be treated with some caution, as the comparability of language is more subjective than the relativities between numbers and the interpretation may not coincide with the meaning intended by the respondents.

The objectivity criteria in the consultative paper specifies that "the methodology for assigning credit assessments must be rigorous, systematic, continuous and subject to some form of validation based on historical experience". Virtually all members of the BCBS specify objectivity or something akin to it as part of their criteria. The two that do not (Luxembourg and the United Kingdom) have recognition criteria based mainly on market usage. The United Kingdom's eligible agencies list is based on a survey of which agencies banks use. Of the non-BCBS members, the respondents from Australia and Hong Kong report the use of objectivity.

The second criteria proposed in the consultative paper is independence, where the methodology must be "as free as possible from any external political influence or constraints, or economic pressures from assessed entities". Only four BCBS member countries explicitly stated the word independence or used a phrase with similar meaning. These were Belgium, Japan, Switzerland and the United States.

Only the Italian respondent explicitly cited transparency as one of the recognition criteria used by the banking supervisor within her country.

The respondents from four of the BCBS member countries explicitly cite credibility as one of the criteria their banking supervisors use. The countries are Belgium, Italy, Switzerland and the United States. Of the non-members, Australia and Hong Kong would also seem to place reliance on credibility.

None of the respondents cited international access as one of the criteria that they currently use to determine whether an agency should be recognised.

Of the BCBS members, only the United States has an explicit resource criterion - the employment of adequate members of staff with the necessary education and experience. However, the Belgian and Japanese respondents specified an examination of the organisation which presumably includes its resources. Of the non-members, the HKMA also take into consideration the number of analysts.

Analysis of the responses show that two BCBS members cite international recognition as one criterion they use. These are Canada and Luxembourg. It is unclear whether they mean

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[16] The Chilean answer has been translated from Spanish, the precise wording may therefore not be identical to the original response.

overseas market usage or regulatory recognition. If it is the former, the Swiss also use such a criterion. Non-members Argentina, Australia and Hong Kong also cite international reputation. Some of the non-members also explicitly use international regulatory recognition. This may raise a potential issue for the implementation of the proposed reforms to the Accord, if non-members are likely to follow the list of agencies recognised by BCBS members, without checking their competency in their own market.

Is there ongoing monitoring of the performance of agencies?

Three of the respondents from BCBS member countries (France, Italy and Japan) reported their prudential supervisors undertake ongoing monitoring of the rating agencies they recognise. In Italy, this is undertaken on the basis of publicly available information. In Japan, rating performance is one of the legal-based criteria for recognition. The law does not detail how this should be undertaken, so it is at the supervisor's discretion.

Of the eight member countries (Belgium, Canada, Luxembourg, the Netherlands, Sweden, Switzerland, the United Kingdom and the United States) which do not monitor rating agencies' performances, four reported caveats to their negative response. In Belgium, files are kept up-to-date which contain significant information on different rating agencies. In the United States, responsibility lies with agencies themselves to report any changes in their organisational structures or rating practices. If any changes affect an agency's credibility, NRSRO designation may be withdrawn. In Canada and Switzerland, the authorities would investigate if evidence became available that an agency was making an increasing number of rating errors (in the case of the former), or its performance was truly questionable (in the case of the latter), which would determine the future of the agency's recognition. In some cases, the difference between those reporting yes and those reporting no with a caveat may be little more than semantic.

None of the non-BCBS members proactively monitor rating agencies' performance. The HKMA point out that although they do not undertake ongoing monitoring, they will review the recognised status of an agency if it comes to their attention that there is a marked deterioration in the performance and/or market acceptance of the agency. The Australians take a similar position. The use of market acceptance as a recognition criterion may act as a substitute for ongoing monitoring: if an agency's performance deteriorates markedly its market acceptance will decline and at some point the agency would fail to meet the criteria and lose its recognition. Although the effectiveness of this may depend on how often banking supervisors revisit which agencies market participants use.

Table 4: The recognition criteria in various countries

Country	What are the Criteria for Eligible Agencies?
BCBS Members	
Belgium	"The rating agencies were recognised on the basis of a general assessment of their credibility (inter alia their effective use by Belgian credit institutions), an examination of their organisation and methodology, with particular attention for their integrity and independence."
Canada	"Although no rating agency criteria is set in our guidelines the list chosen represents those firms that are internationally recognised for having accurate and fair ratings while maintaining a long history."
France	Information not in the public domain.
Italy	"The agencies are chosen on the basis of their credibility, objectivity, transparency and role played in the Italian market."
Japan	"Rating performance, management structure, organisation, rating methodology and independence from capital structure."
Luxembourg	"The main criteria are the agencies' international recognition and their market presence."
Sweden	"No specific criteria has been developed regarding which rating agencies are eligible. However, we would only allow any of the major agencies that has a long standing track record and whose performance could be checked if needed. The three rating agencies that are considered to be eligible are the ones that the Swedish banks use when the rating their debt instruments."
Switzerland	"objectivity/experience/reputation/independence/coverage of counterparties located in Europe, North America, and Japan".
UK	"Market recognition".
USA	"Potential NRSROs must meet the following criteria: • Recognition as being credible and reliable from the predominant users of security ratings in the US. • Ability to operate independently of economic pressures or control of the companies being rated (e.g. having sufficient financial resources) • Employing an adequate number of staff members with the education and experience necessary to competently evaluate an issuer's credit • Utilising systematic rating procedures designed to produce credible and accurate ratings • Practising internal compliance procedures to prevent the misuse of non-public information"
Non-members of the BCBS	
Argentina	"In the case of the central bank registry, there are two conditions for participation: (a) the rating agency must provide ratings in at least ten countries and five of them must be in Latin America; (b) their report must follow guidelines set by the central bank. In case of the registry of the stock market watchdog, the requirements are: (1) to be organised as a limited company; (2) the sole object of which is credit rating activities; (3) a minimum capital of USD 250,000; (4) disclosure of shareholders' names; (5) get approval for rating procedures and manuals from the watchdog; (6) its directors cannot be shareholders, directors or employees of those companies they rated."
Australia	"We have no formal criteria for determining acceptance of rating agencies. Basically, we look at status and acceptance of agencies in the market and by other regulators (this is noted above especially relevant where a rating agency does not operate in Australia) and the performance of the agency. Performance is more relevant in the Australian context where we can sometimes compare assessments and monitor performance of institutions relative to their ratings."
Chile	Coverage, reputation, history and position in the market.
Hong Kong	"The criteria for assessing the eligibility of the regulatory agencies include; (i) ownership, history and background for the agency; (ii) methodology and coverage of the ratings; (iii) market acceptance; and (iv) regulatory acceptance and its purpose"

Table 5: HKMA's minimum acceptable ratings for three purposes

Recognised agency	Purpose				
	Liquidity ratio		Discount window		Lender of last resort
	Long-term	Short-term	Bank issuer	Non-bank issuer	
Moody's Investor Service, Inc	A3	Prime 1	A3	A2	Baa3
Standard & Poor's Corporation	A-	A-1	A-	A	BBB-
IBCA Ltd	A-	A1	A-	A	BBB-
Thompson Bankwatch	A+	TBW-1	A+	AA-	BBB+
R&I	A+	a-1+	A+	AA-	BBB+

How are differences in ratings between the rating agencies (i.e. split ratings) handled?

Perhaps unsurprisingly given that seven out of eleven BCBS member countries use rating agencies' ratings in their banking supervision for just the standardised methodology of the Market risk amendment (or CAD if their European), virtually all respondents from BCBS member countries reported the criteria for a qualifying item. This states that the instrument must be "rated investment grade by at least two credit rating agencies specified by the national authority; or rated investment-grade by one rating agency and not less than investment grade by any other rating agency specified by the national authority". [17] The exception was the US, where most regulators adopt an explicit policy, accepting the either the highest or second highest rating. [18]

The responses on the treatment of splits were more varied from non-BCBS members. The Australians reported that most of their use of ratings was set in terms of a benchmark. It was only in the case where a split disagreed as to whether an entity is above or below the benchmark that it would cause a problem. In these circumstances, their prudential guidelines allow scope for a bank to make a case to APRA to disregard the lower rating. In Hong Kong, a particular security only needs to meet the minimum acceptable rating of one of the five recognised credit rating agencies to become eligible for the liquidity regime, the discount

[17] Taken directly from the BCBS market risk amendment.

[18] In contrast, the National Association of Insurance Commissioners (NAIC) uses independent analysis. The NAIC's Security Valuation Office (SVO) uses its own judgement in choosing either the higher or lower rating.

window and the lender of last resort function. The latter are displayed in Table 5. They are of interest because the HKMA discounts some agency's ratings relative to others. They map the different ratings assigned by the recognised credit rating agencies by looking at the definitions they use for each ratings category and by comparing the ratings they assign to some selected corporations. They follow the standard treatment for market risk.

In the disclosure regime in New Zealand, the bank is required to reveal all ratings and any differences in views between rating agencies would be transparent to readers. They further report "The Reserve Bank has deliberately attempted to encourage competition in bank analysis (and not only from rating agencies…), in the expectation that this will publicly raise discussion on key issues relating to bank financial performance and position". Rating splits are therefore not viewed in a negative light.

Is there a distinction in the treatment of solicited and unsolicited ratings?

In ten out of the eleven BCBS member countries that use ratings, respondents report that their banking supervisors do not distinguish between solicited and unsolicited ratings. A number of countries express unease about their use of ratings based purely on public information. However, only the US respondent reports that the supervisors are currently considering making a distinction. Respondents from Luxembourg, Sweden and the United Kingdom acknowledge concern about the use of unsolicited ratings, but report it is not a particularly live issue because of the absence or infrequency with which unsolicited ratings are issued in their countries.

The Canadian response reports that "although not explicit in our guidance, OSFI believes that only solicited ratings should be acceptable". It does not however state how this principle is implemented in practice, given that not all rating agencies signal whether a rating is unsolicited and therefore based on public information.

The non-BCBS members echo the sentiments of the BCBS members. They do not draw distinction between solicited and unsolicited ratings, but have reservations about the use of the latter.

Conclusion

Of the twelve BCBS member countries surveyed, only Germany does not use credit rating agencies' ratings in its banking supervision. Of the remaining eleven, seven use them only for the market risk amendment (or CAD). On average, BCBS members currently recognise six agencies. In general, there has not been much change to the list of eligible agencies over time because its construction is relatively recent reflecting the date of the market risk amendment (or CAD). Most of the eleven supervisors use objectivity as one of their recognition criteria. Their use of the other five criteria is more patchy, with two, transparency and international access, being used rarely, if not at all. Only three BCBS members undertake ongoing monitoring of agencies. Splits are generally dealt with using the conditions under the market risk amendment for a qualifying item. There does not appear to be a distinction between the treatment of solicited and unsolicited ratings.

Appendix 1
Table 6: A partial list of ratings-dependent regulation in the United States[19]

Year Adopted	Ratings-Dependent Regulation	Minimum Rating	How many Ratings?	Regulator/Regulation
1931	Required banks to mark-to-market lower rated bonds	BBB	2	OCC and Federal Reserve examination rules
1936	Prohibited banks from purchasing "speculative securities"	BBB	Unspecified	OCC, FDIC, and Federal Reserve joint statement
1951	Imposed higher capital requirements on insurers' lower rated bonds	Various	N.A.	NAIC mandatory reserve requirements
1975	Imposed higher capital haircuts on broker/dealers below-investment-grade bonds	BBB	2	SEC amendment to Rule 15c3-1: the uniform net capital rule
1982	Eased disclosure requirements for investment-grade bonds	BBB	1	SEC adoption of Integrated Disclosure System (Release #6383)
1984	Eased issuance of non-agency mortgage-backed securities (MBSs)	AA	1	Congressional promulgation of the Secondary Mortgage Market Enhancement Act of 1984
1987	Permitted margin lending against MBSs and (later) foreign bonds	AA	1	Federal Reserve Regulation T
1989	Allowed pension funds to invest in high-rated asset-backed securities	A	1	Department of Labor relaxation of ERISA Restriction (PTE 89-88)
1989	Prohibited Savings & Loans from investing in below-investment-grade bonds	BBB	1	Congressional promulgation of the Financial Institutions Recovery and Reform Act of 1940
1991	Required money market mutual funds to limit holdings of low-rated paper	A1[20]	1[21]	SEC amendment to Rule 2a-7 under the Investment Company Act of 1940
1992	Exempted issuers of certain asset-backed securities from registration as a mutual fund	BBB	1	SEC adoption of Rule 3a-7 under the Investment Company Act of 1940
1994	Imposes varying capital charges on banks' and S&Ls' holdings of different tranches of asset-backed securities	AAA & BBB	1	Federal Reserve, OCC, FDIC, OTS Proposed Rule on Recourse and Direct Credit Substitutes
1998	Department of Transportation can only extend credit assistance to projects with an investment grade rating	BBB	1	Transport Infrastructure Finance and Innovation Act 1998
1999[22]	Restricts the ability of national banks to establish financial subsidiaries	A	1	Gramm-Leach-Biley Act of 1999

[19] Unless otherwise noted, the items in the table are reproduced from the following paper: Cantor, Richard and Frank Packer. "The Credit Rating Industry" in *FRBNY Quarterly Review*, Fall 1994; 6. For other ratings-dependent regulation, refer to SEC Release No. 34-39457, File No. S7-33-97; pp. 1-8.

[20] Highest ratings on short-term debt, generally implying an A- long-term debt rating or better.

[21] If issue is rated by only one NRSRO, its rating is adequate: otherwise two ratings are required.

[22] Gramm-Leach-Billey Act of 1999, Title I, p. 91.

Part II. Complementary Sources of Credit Information

Section A. Regionally Based Credit Scoring

Introduction

According to the Basel Committee's June 1999 Consultative Paper, the rationale of the First Pillar of the new capital framework is driven mostly by the perceived need to replace the current fixed risk weightings with external credit assessment or internal ratings, as far as "sophisticated banks" are concerned.

The Consultative Paper suggests introducing external credit assessments published by large international rating agencies, such as Standard & Poor's, Moody's Investor Service, and Fitch-IBCA. Whatever the advantages of such data, these ratings could display an excessively tight coverage of counterparties in some banks' portfolios, and hence they would not much improve the risk weighting framework. [23] It is therefore worth looking at other sources of credit risk assessment, such as central credit registers (CCRs), and scoring based on central financial statements databases (CFSDs).

CCRs and CFSDs are a kind of service provided by several European central banks, sometimes operating jointly with the banking sector. The CCR service involves collecting, processing, managing and releasing information on banks' credit exposures, while CFSDs do the same on the credit quality of counterparties to which banks are exposed.

The first two parts of this section analyses both services. The analysis covers the institutional scheme governing the systems (ownership and maintenance); the components of these databases (data subject to reporting, reporting thresholds, etc.); and coverage, or the share of credit exposure on which a credit risk assessment is issued. The third part deals with technical aspects of data collection and publishing, and the fourth part discusses the underlying rating methodologies and main issues raised by linking ratings and default statistics.

The main findings regarding CCRs and CFSDs in the countries studied [24] show that the two systems have common features regarding core information services, but larger differences for non-core information. CCRs basically include exposures on corporate and sovereign counterparties, but they differ as to whether or not they include data on private customers or financial institutions. Banks are reporting institutions regardless of the country in which they are based, but investment services companies may be associated.

CFSDs focus on corporate entities. The sizes of databases may vary greatly, but in general, data collection is designed to capture 10-20% of the largest counterparties weighting for

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[23] This could be a concern especially for non-US and non-UK banks given the prominent weight of US- and UK-base d counterparties reported in rating agencies surveys, despite a sharp but recent rise in the share of non-US issuers in the total number of rated issuers.

[24] Austria, Belgium, France, Germany, Italy, Portugal and Spain.

80-90% of the total exposure or of total business activity. In terms of coverage, CCRs generally capture the bulk of exposures carrying credit risk (except exposure resulting from futures and derivatives) at least on non-banking counterparties.

Central banks often use their own branch networks and systems for data collection and processing, but may operate in joint venture with the banking sector. Banks are the main recipients of CCRs and CFSDs services. Depending on the services provided, general or tailored studies using CFSDs data may be publicly released.

The underlying rating methodology is a critical point in assessing the reliability of a credit information system. The systems under review include the assessment of counterparties' abilities to meet their financial obligations insofar as they have been often originally designed for appraising the quality of bills discounted by central banks. However, the analysis may encompass a broader view on the overall situation of rated entities. The analytical approach is either judgmental or quantitative (depending on the model) but the development of quantitative models seems to be a common trend, although these models are not embedded the same way in the rating process. Discriminant analysis or comparable approaches are the most common ones, but alternative approaches like expert systems may be observed.

Whatever the quality of the rating approach, the effectiveness of this approach in a credit risk assessment process depends on the ability to link the ratings classes to a default probability function. Once this link is established, the credit assessment system has to be sufficiently stable (the relationship between rating classes and default probability should not fluctuate randomly) and sensitive (ratings must response promptly to credit events). One difficulty encountered when comparing the different rating systems derived from CFSDs is in the discrepancy in the legal and economic definition of "default" used in each system in various countries. Research is being conducted at the European Central Bank (ECB) and national central banks (NCB) level to address this issue.

Regionally Based Credit Scoring

This section of the study focuses on seven European countries that have implemented CCRs and CFSDs. The countries covered are Austria, Belgium, France, Germany, Italy, Portugal and Spain.

CCRs are owned and managed by European central banks. CCRs collect data from banks describing their credit exposures and details on each borrower. The scope of the data depends on the reporting country. At a minimum, CCRs include corporate borrowers and public administrations. The collected data is used for banking supervision and monetary purposes and is fed back to the reporting banks.

CFSDs are generally owned and managed by central banks. In some cases, ownership and management is shared with the banking industry. Originally empowered to discount trade bills to refinance banks, central banks built up corporate information files to appraise the creditworthiness of signatures presented for discounting. The banking industry was later granted access to these kind of files, which include corporate financial statements and the ratings assigned to each corporate recorded in the database. The coverage of different sectors varies with each CFSD. Ratings result from either judgmental or statistical methods. CFSDs can be used to determine eligibility of corporate debt instruments in central banks' banking

refinancing procedures, banking supervision, and economic research. Banks use these ratings for assessing credit risk.

CCRs and CFSDs are national or shared databases. Each countries' coverage does not go beyond their national borders. Within their borders, however, these databases aim at being as exhaustive as possible. In most cases, they are more exhaustive than rating agencies with regards to specific geographical coverage. As shown in the tables, these central databases are often monopolies, either owned by government agencies/central banks, or by private operators. In this respect, central databases work under a more or less compulsory regime, by which contributors must abide. Central databases have a dual role - for the central banks and the banking system as a whole, and sometimes for additional claimholders like insurance companies or other non-banking financial companies. Furthermore, they differ from rating agencies since they are not fuelled by data provided by borrowers or issuers, but by public information or private data specifically released to the central databases by creditors themselves.

It is also worthwhile to note Credit Assessment Agencies (CAAs), which are discussed in more detail later in this section. CAAs have much in common with CFSDs and rating agencies in that their business is based on collecting financial information on companies. Beyond this, the purposes and organisation of CAAs are different from those of CFSDs. CAAs are private businesses that sell information or provide consultancy services regarding credit management and cash collection. Generally, they assign ratings based on proprietary methods, but these are only a part of a whole set of commercial services. Many of their clients are commercial and industrial companies that need to assess the creditworthiness of their own clients and vendors. CAAs do not operate as public or mutual information providers as central banks do, especially vis-à-vis the banking industry. This study partly addresses the issue of CAAs. As profit-driven organisations, CAAs cannot operate as official or mutual information providers, and do not benefit from a legally binding status. As a result, they only rely on public data, which can be bought on the market. They do not have access to non-public data, which may be released to a central register, especially banking exposure to non-financial counterparties. In this respect, central registers have a clear advantage in terms of independence as public or mutual organisations.

Central Credit Registers

Ownership and maintenance of CCR databases

CCRs are most often owned and managed by central banks. These systems have been implemented for a long time (established in 1946 in France, 1963 in Spain, 1964 in Italy, 1967 in Belgium) and have legally binding statuses. The general goal of CCRs is to enhance the transparency of banking activities and make these activities secure.

Given the necessary close relationship with credit institutions, the concerned European central banks were required by law (or provisions of specific banking regulations) to collect, process and dissiminate information regarding credit exposure. France's CCR (the *Service Central des Risques*) was established by the Banking Regulatory

Committee[25] in March 1946. In Germany, the provisions governing the CCR are found in sections 2(2), 14, 19 and 20 of the Banking Act. The Spanish CCR was established by a Decree-Law (special government's ruling enforced as a law) in June 1962. In Belgium, the law of 1967 establishing the CCR is integrated in section VI, article 91, of the Banking Supervision Law of March 1993, and the practical aspects are governed by the Royal Decree dated December 1994. The Italian CCR was established in 1964 under a decree issued by the Interministerial Committee for Credit and Savings. The legal basis of that decree was the 1936 Banking Law. The move was confirmed by a 1994 decree based on the 1993 Banking Law.

Components

The components of CCR databases (system contributors and participants) are detailed in Tables I to IV (pp. 78-81). The CCRs of the countries reviewed in this section all handle reports on financing granted to corporates, and to at least a share of public administrations. Beyond this common purpose, the European CCRs display several differences.

CCRs' elementary data include the necessary information for identifying borrowers such as national identification number, name and/or trademark, address, economic sector, and geographical zone for foreign borrowers.

As for data on categories of borrowers, corporates are included in all the CCRs without exception. Public administrations are also included, but some CCRs have introduced limits to the scope of reporting on such organisations. This is the case in Germany where the CCR only includes foreign public authorities. In Austria and Belgium, central government bodies' exposure is not reported. However, the gap that results from these limits is not material since the majority of CCRs do not include negotiable debt instruments, which are the only financing instruments used for central government funding. Nonetheless, the absence of the local government bodies in the German CCR may imply stronger consequences in the reporting gap between the systems.

Except for these two categories of borrowers, the CCRs show some diversity: household borrowing is reported in Belgium, Italy, and Portugal. Some individual borrowers are reported in the French CCR, but only in the event of individual entrepreneurship. Including households may create some difficulties: the number of reported loans could make up the bulk of all the reported financings in the event of a low reporting threshold in terms of loan amount. In such cases, the main problems are handling a huge database on the one hand, and finding reliable and computable public information to appraise these loans on the other. otherwise the CCR is only used to assess global amounts of loans to private customers. In general, such heavy reporting as a CCR is not necessary only to assess sectoral amounts of credit but it should also support credit quality appraisal. The latter is difficult to achieve regarding private customers because of the lack of relevant data and of the regulation protecting privacy, which is more stringent when households are concerned than professionals and institutions. For example, in France, collecting data on individuals is subject to a formal approval of the National

[25] The title of the banking regulator was "National Credit Counsel" at that time.

Commission of Information Technology and Freedom (*Commission Nationale Informatique et Liberté*) which verifies that the privacy protection regulation is properly enforced.

Reporting on credit institutions also varies among European CCRs. Some data related to exposure on credit institutions is available in Austria, Germany, France, and Italy, but the scope of the institutions reported on is not fully comparable. In France, the CCR reports on foreign credit institutions with exposure beyond one year. The German CCR is the most expansive database in terms of reporting on credit institutions. It includes exposure of banks' general managers and their families, the exposure of public credit institutions, and interbank loans with maturity of up to 90 days. The German CCR began reporting on interbank exposure in 1996 (Fifth Amendment to the Banking Law).

Reporting thresholds with the categories of borrowers differ among existing CCRs. When denominated in euros, standard reporting thresholds range from zero in Portugal to EUR 1,533,876 in Germany. The average threshold value is about EUR 300,000. Excluding Germany, which has an average threshold five times the overall average, the average threshold is more realistically at about EUR 90,000. These differences have big consequences on the range of the number of reported entities in the CCRs. However, the gap between the German CCR and the others is partly filled since the threshold of EUR 1,533,876 covers groups of "combined borrowers", defined as not only borrowers consolidated by the same parent company, but also those subject to extended financial or trade relationship that entails a mutual or one-sided dependence. This extended definition of "borrower" is consistent with that of the prudential regulation of "large exposure". Moreover, some countries have introduced specific reporting thresholds for either foreign counterparties (Spain), impaired loans (Italy), or exposure of foreign branches of domestic banks (Belgium). (See Table IV.)

The most common periodicity among the CCRs under review is monthly reporting, except for the German CCR, which is on a quarterly basis.

The types of financing instruments reported on in all the CCRs under review include loans (drawn amount), committed credit lines (undrawn portion), and granted guarantees, except for Belgium and Portugal, which do not collect data on guarantees. Not surprisingly, gaps between CCRs widen as the distance between the instrument categories of the core credit portfolio increases. The German and the Italian CCRs have the most comprehensive set of reported instruments and additional information: credit equivalent amount of derivatives, events of borrowers' bankruptcies and maturity of mortgage loans (Germany), impaired/delinquent loans [26] and risk-mitigating guarantees (Italy). Impaired loans are also reported in Spain, whereas the French CCR's default reporting framework includes bankruptcy cases and events of payment default. The Spanish CCR includes fixed-income securities and the French system has data on securitised loans [27].

All the CCRs studied here have common features as far as the core reporting institutions are concerned, namely the domestic credit institutions head offices. The remaining contributors differ from one CCR to another.

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[26] Reporting thresholds are not applicable with respect to impaired loans, which have to be completely reported.

[27] It is an indicator of the existence of securitised loans but not a comprehensive report.

The domestic credit institutions head offices make up the bulk of the credit exposure reports. In addition, the foreign branches of the domestic banks are generally included within the scope of the registers. Moreover, all European CCRs collect data from European branches of foreign banking groups. The German CCR is probably the most extensive register in terms of reporting institutions due to the Fifth Amendment to the German Banking Law, which extends the compulsory reporting to investment services institutions. Leasing companies report to the CCR only if these companies are banking subsidiaries. Additionally, the German CCR includes reports from domestic banking subsidiaries incorporated abroad, and those from insurance companies. The Spanish CCR is the only register which extends reporting obligations to the Central Bank and to deposit insurance and mutual guarantee funds. From 1997, the Italian Credit Register also includes loans from leasing and consumer credit companies.

Coverage ratio

The number of reported borrowers vary from one register to another (see Table II) as a result of the differences in reporting thresholds and status of concerned borrowers. However, some indicators are useful in approximating the registers' coverage. Hence, given the reporting thresholds of each country, one can assume that the majority of the most important borrowers (carrying the major part of banking financing) are properly described in the registers. Furthermore, the proportion of the reported financing to the amount of assets held by the banking system (for the same categories of assets as in the registers) generally exceeds three-quarters depending on the country. In France, the exposures on corporates reported in the register cover about 80% of the total corporate financing (90% for industrial and commercial companies, see Table V, % of outstanding credit); the register does not cover the "very small businesses" (individual entrepreneurs, small corporates) of which individual loans may not exceed the reporting threshold. The total value of exposure reported in the French CCR represents about EUR 550 billion[28], which makes up the bulk of corporate financing. Hence, when added to the approximately EUR 380 billion in household financing, the total corresponds to 90% of total banks' loans to non-banking counterparties. In Germany, the total reported value of exposure is about EUR 4,000 billion (derivatives credit equivalent excluded), or about 90% of German banks' total interbank funding and corporate/private customers financing. The Spanish register reports a total amount of EUR 900 billion, which represent an equivalent proportion and 80% of the total financing is identified in the Italian register. The Austrian CCR covers about 70% of overall bank lending.

The CCRs display a significant share of the total banking loans, at least to non-financial counterparties in most countries. As a matter of fact, coverage ratios seem sufficient enough for using credit registers. Moreover, it is crucial to link each identified counterparty (or groups of similar counterparties) to an available and reliable credit risk assessment. It depends mainly on the quality of the financial statements databases, on the one hand, and on that of the prevailing credit risk assessment methodologies, on the other hand.

[28] EUR 920 billion, including off balance-sheet items.

Central Financial Statements Databases

The CFSDs show a different overall picture from the CCRs. Indeed, collecting, processing and analysing financial statements are not spontaneously subject to central banks' monopolies. (Germany shows a major exception to central banks' monopolies on credit registers with the SCHUFA database[29].)

Contrary to credit exposure reported in CCRs, financial statements are generally public information, although they may be difficult to get in practice. Other institutions, either public or private, may share financial data collection/analysis with the central banks. In general, the situation regarding CFSDs is close to the opposite of that regarding CCRs. On the one hand, CCRs collect relatively simple but proprietary data (low cost either on the collecting or on the processing side) released by a limited number of credit institutions. On the other hand, the theoretical scope of reporting entities to CFSDs is much larger since it includes financial statements issued by all entities subject to financial reporting (corporates, individual entrepreneurs, independent government agencies, special purpose entities, etc.). All of these may encompass hundred of thousands to millions of individuals, depending on the size of the economy, and hundreds to thousands of different sectors. As a result, the practical cost of data collecting, processing and analysis is heavier than for credit risk exposure. This may explain why some institutions focus only on data collection or processing, or limit their data collection and analysis to specific kinds of financial reports issuers.

In the field of CFSDs, central banks compete with private databases, at least in some economic segments. The next section will look mainly at the central banks' databases.

Ownership and Maintenance of CFSD databases

In all the countries under review, the central banks hold and manage their own databases, except in Italy, despite different data collection and distribution processes. The organisation of the Italian CFSD is unique: rather than implementing its own database, the Bank of Italy set up a joint partnership with the Italian Banking Association to establish the " Centrale dei Bilanci" (CDB). CDB is incorporated as a private company.

Except for the central banks' CFSDs, private CAAs or local chambers of commerce provide similar services, although targets may differ. The world-wide business information group Dun & Bradstreet (Moody's main shareholder) has set up subsidiaries in each European country and it holds generally a large stake in the local markets of business information. In France, Dun & Bradstreet encounters fierce competition from COFACE-SCRL (subsidiary of the French export insurance group COFACE) and ORT. Each of these three companies display comparable data resources (15 to 20 million financial statements of European corporates.

[29] SCHUFA is a shared database established by retailers to appraise private customers' credit quality for consumer credit.

Components and coverage ratio

The basic components of these databases are financial statements, entered either on a specifically standardised format dedicated to the CFSDs, or according to the general accounting rules and internal revenue reporting format. The financial statement issuers are identified in the database with their national identification number, incorporation and trade names, and economic sector, which can be matched with the CCR's identification data. The CFSDs include only corporate financial statements. They sometimes include other businesses under status of partnership or special purpose vehicles. However, given the lack of comparability with the reports issued by public administrations or insurance companies, these are generally not included.

The major finding regarding the components and coverage of CFDSs is that the "20/80" or "10/90" rule generally applies: few medium and large firms account for the majority of total corporate banking indebtedness, of total staff employed, etc.

France's CFSD, the FIBEN (*FIchier Bancaire des ENtreprises*), covers a significant share of the French corporates. According to the French National Institute of Statistics (INSEE), there are about 2.1 million French corporates. These corporates are legally bound to submit their financial statements to the trade courts and the tax office, which has set the standard reporting format named the "tax wad". Of this total, corporates are divided into two groups tax-wise: 1.7 million report industrial and commercial profits, and 0.4 million report non-commercial profits. Of the industrial and commercial corporates, 64%, or 1.1 million, release simplified financial reports and 36% (640,000) release comprehensive detailed reports. Comprehensive reports correspond more or less to the largest companies that have a prominent share in the GDP, with the highest number of total staff employed, and corporate banking indebtedness. FIBEN mainly collects data on the comprehensive reports for corporates with turnover more than EUR 0.76 million. The FIBEN sample includes about one-third of the firms issuing comprehensive reports and which account for nine-tenths of the corporate indebtedness and of total staff employed.

Within this sample of 230,000 entities, about 50,000 release "non-standard" financial statements due to the specificity of their economic sectors, such as education, health, government agencies, financial services except banking, and real estate.

The database shows a bias overweighting in the manufacturing and trade sectors. The 180,000 "assessable" reports (28% of the comprehensive reports, 9% of the total number of firms) cover 45% of the recorded amounts in the CCR (see Table V). FIBEN has a long track record of more than 25 years. It includes individual and consolidated financial statements. The latter group of financial statements is not included in the above mentioned figures.

In Germany, the Bundesbank's CFSD covers about 70,000 financial statements (number ranging from 50,000 to 80,000 depending on the year) with a track record of more than 25 years. The total number of firms in Germany is 1.75 million. The German CFSD covers 60% of the total taxable turnover and 60% of the aggregate amount of corporate balance sheets. However, as shown in Table V, the coverage ratio is much better for large industrial firms incorporated in the former West Germany. Consolidated financial statements are not recorded in the database. Financial statements are released according either to a "tax format" or a "commercial format". The latter is more business oriented and is released three months after year-end. The tax format is delayed by one year, but is a simpler report and represents the bulk of financial statements.

Contrary to the FIBEN system, the size of the German CFSD's sample is not driven by a fixed reporting threshold but depends on debt and collateral rules in the Bundesbank's refinancing procedures. Indeed, the eligibility of collateral is conditioned by banks' reporting of corporate debt issuers' financial statements to the Bundesbank. Otherwise, financial statement collection by the Bundesbank is not compulsory. As a result, the sample size fluctuates accordingly and the largest high credit quality corporates are usually overweighted in this sample.

The organisation of Austria's CFSD is similar to Germany's. Data collection depends on the eligibility of corporate debt instruments as collateral for the central bank's liquidity injections. As in the previous examples, the largest manufacturing firms are overweighted in the Austrian database. However, an additional set of financial statements released by small businesses is collected by a specialised research institute, IGH[30], and is integrated in the National Bank of Austria's information system. The coverage ratio is noted in Table V.

In Italy, the Centrale dei Bilanci (CDB) includes 40,000 individual financial statements, less than 4% of the total number of companies. Of those, 1,300 are detailed reports from large companies, and 700 are consolidated financial statements. Despite the scope, which expands beyond the manufacturing sector to real estate, leasing, and holding companies, the majority of the statements are from large manufacturing firms in the industrialised north of Italy. The reporting turnover threshold of the CDB is EUR 100 million, compared with the EUR 0.76 million threshold of the French CFSD. However, the reports available have many details, especially the consolidation perimeters and shareholding links. The CDB was set up in 1983. As in Austria, other institutions have set up a database that captures more fully the small- and medium-sized companies. The local Chambers of Commerce and local companies have set up the CERVED database as a joint stock company. It has collected the financial statements of about 500,000 private limited companies since 1993. CERVED's scope is more representative of Italian corporates than the CDB's, but the reporting framework is less detailed. According to an agreement with CERVED, the CDB also provides the financial statements of the companies included in the CERVED database.

In Spain, a comprehensive set of databases has been set up to complete the original CFSD (see Table V). The first database, *Central de Balances Annual* (CBA), was established in 1983. It includes 8,000 detailed financial reports from large corporates, which account for 36% of the national aggregate turnover. These reports are confidential. The framework results from a detailed questionnaire of about 600 items (for large corporates), or 300 items (for other corporates). The Bank of Spain has introduced collecting some qualitative information. It requests firms to release a statement related to the sources and application of funds (detailed cash-flow analysis). The CBA is updated on a yearly basis.

An additional database, *Central de Balances Trimestral* (CBT), was set up in 1993. It covers a sample of 1,000 large firms and includes a quarterly simplified questionnaire mainly focused on P/L items.

In order to expand its coverage toward small- to medium-sized companies, the Bank of Spain has cooperated for 10 years with the local Registers of Commerce. These registers collect

[30] Institut für Gewerbe- und Handwerksforschung.

300,000 financial statements. Of these statements, about 170,000 are useful for analysis through the *Central de Balances del Banco de España - Registros Mercantiles* (CBB). The financial reports are based on a 300-item simplified questionnaire.

The National Bank of Belgium's (NBB) CFSD is unique in that the NBB is the only central bank empowered by law since 1976 to collect all financial statements. In general, in countries where such a legal obligation is enforced, the national institute of statistics, trade courts, or chambers of commerce collect the statements. Thus, the NBB holds an exhaustive database which covers about 200,000 firms. Firms that release a "simplified report" have the following features: annual turnover of less than EUR 5 million, balance statements of not more than EUR 2.5 million, or an average of less than 50 staff members. The number of these small- to medium-sized companies is 190,000 and account for 95% of the total, but only 15% in terms of balance statements value, and 20% in terms of value added. (See Table V for breakdown by sector.)

No CFSD has been established in the UK, but the Bank of England (BOE) performs some specific studies on the corporate sector either to appraise the situation of possibly large ailing firms or to assess small businesses' access to banking financing.

The EU member-states set up the European Financial Database Committee in 1985. The committee's work has created the Harmonised European Accounts Database (known by its French acronym BACH). BACH includes corporate financial statements from 13 countries [31] under harmonised reporting standards. This database is managed by the European Commission (General Directorate II - Financial Institutions and Business Law). The countries which do not have a CFSD use national institute's statistics. Except for Belgium, the samples include limited numbers of corporates (see Table V). The database results from the committee's target to focus on methodological harmonisation and mapping the criteria of eligibility of corporate debt instruments as collateral for central banks' liquidity funding. It is worthwhile to note that BACH would probably not be sufficient to conduct a European-wide individual corporate analysis since it has not been designed for such a purpose. However, in the course of defining comparable risk assessment methodologies, the results may be useful.

Organisation of data collection

Data collection is done through two possible channels, non-banking firms to be rated and specialised collectors of financial data.

The Bundesbank and the National Bank of Austria collect corporate financial statements on a compulsory basis when banks intend to discount trade bills or to collateralise corporate debt instruments. In this event, central bank funding is conditioned by reporting the financial statements of the corporate debt issuers to CFSDs. Both central banks review the data quality and analysis. In order to enlarge their data collection bases, they have tied links with external data providers specialised in small- to medium-sized businesses. The Bundesbank's network

[31] Austria, Belgium, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Portugal, Spain, Sweden and United States.

is involved in data collection, the Statistics Directorate performs data processing, and the Credit Directorate is in charge of analysing the financial statements (see rating methodology).

The Bank of France (BOF) and the National Bank of Belgium (NBB) both collect financial statements directly from their issuers. As mentioned above, the NBB is the only central bank legally empowered to collect all corporate financial statements. The BOF uses its network of 211 branches to collect data. This approach has the advantage of keeping a direct link with reporting firms, and therefore it enhances local analysts' knowledge not only of the firms themselves but also of their specific local environment. It also influences firms' willingness to cooperate, since BOF branches can tailor the contents through selling "value-added analysis" from the CFSD. However, the drawback of this approach is the volume of resources that would be required to expand the scope of reporting corporates to those with less than FRF 5 million in turnover. The BOF database manages 200,000 firms with about 1,000 staff members. Data collection and analysis are decentralised activities performed by local branches. The global data processing and the rating methodology guidelines are centralised at the Corporate Directorate of the BOF.

The Bank of Spain (BOS) and the Bank of Italy (BOI) have delegated data collection to a joint subsidiary (BOI) or to distinct institutions (BOS) properly equipped for this purpose. The BOS' total staff is 3,200 and its local branches are limited to 53. Thus, the staff dedicated to corporate analysis is limited to about 50 people who focus on data processing and analysis. The BOI's choice of a joint subsidiary (CDB) with the Italian Banking Association fosters a transparent pricing policy of data diffusion. However, these institutions depend on their agreements with other public administrations or private operators.

Technical aspects of data collection

Data collection is generally performed through digital devices but sometimes not completely. The BOS and the BOI have implemented a fully digital data flow with their information providers. It is one possible advantage of using a proxy for collecting data: it may be more convenient to set a digital flow with one counterparty than with thousands (of banks) or hundreds of thousands (of corporates). For example, the BOS uses an optical character recognition to "digitalise" the original Registers of Commerce's reports. At the Bundesbank, two-thirds of the raw information is collected through digital devices and it plans to implement remote data transfer from "machine to machine" or on-line processing. The BOF has already implemented such a remote data collection system.

Database Users

Central Banks are the main users of their own databases. Their primary purpose for a long time has been assessing the eligibility of bills and corporate debt instruments in central banks' funding procedures. It remains the main purpose of the German and Austrian systems since these institutions do not have any direct supervisory responsibilities for banks, as in Belgium. However, these central banks share information with the Banking Supervision Authorities

(BSA)[32] to prepare on-site examinations and perform banking analyses. In France and Spain, the purposes are the eligibility assessment of bills and debt instruments, risk analysis for banking supervision and research purposes. In Italy, CCR data and financial statement data are used for research and supervisory purposes. For supervisory purposes, BSAs have to match CCRs and CFSDs to investigate banking portfolios. They do this to either look at the global situation of portfolios, or to look at individual counterparties, especially for preparing on-site examinations. Moreover, the BOF and the BOI have implemented automated tools [33] for banking analyses to provide examiners with highly data-intensive analyses of banks' financial and prudential situations.

All countries under review perform macro- or micro-economic analysis and research using CCRs and CFSDs.

Banks are the second main users. CCRs redistribute information on exposure to enable each bank to appraise its share in the total banking indebtedness of its customers. Hence, each one can access its "market share" in lending activities. CFSDs disclose corporate ratings and financial statements. The combination of both sources of data offers banks a useful instrument for customers' exposure monitoring and comparing their lending policy with that of competitors. Moreover, the BOF has made information on eligible high credit quality corporates available on the Internet. All banks operating in the euro zone can retrieve this information, according to the BOF's and ESCB's liquidity procedure.

Corporate contributors to CFSDs - either directly or through banks' reports to CFSDs - receive their own ratings. In France, companies rated by the BOF have the legal right to access and to modify information reported in the FIBEN database. CFSDs may offer "value added" services beyond these minimum requirements.

Some central banks carry out extensive information strategies toward corporates, especially the BOF and the BOS. Except the retrocession of their rating, these CFSDs add commercial information services to companies. These services range from disclosure of detailed ratios to quasi-consultancy and contribute to cover data-collecting and processing costs. The BOF has intensively processed FIBEN's data into commercial products such as rules-based expert system diagnosis ("GEODE") and financial analysis packages ("Modules FIBEN"). The BOS releases detailed ratios analysis including peer-group comparisons. The information contained in the Italian CDB are distributed only to members' bank and to the BOI.

Rating methodology and statistical relationship between ratings and corporate defaults

Purposes of rating methodologies and best practices

First, before analysing the rating methodologies, it is necessary to point out the different purposes of these methodologies. The Bundesbank and Bank of Austria restrict the purposes

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[32] The Federal Office of Banking Supervision (BAK) in Germany, the Banking and Financial Commission in Belgium and the Ministry of Finance in Austria.

[33] The BOF has implemen ted the SAABA system ("Banking Analysis Support System") and the BOI the PATROL system.

of their respective corporate ratings to assigning eligibility/non-eligibility status to trade bills and other corporate debt instruments, as does the BOS. The BOF aims to maintain a corporate classification system that would be useful either for eligibility assignment, the prudential review of banking portfolios, or for information on banks for internal risk management purposes. The BOI's corporate classification system has been developed by the Supervision Department for research purposes. It is also used for prudential analysis. Nonetheless, whatever the effective use of in-house corporate ratings assigned by central banks through their CCRs and CFDSs, the historical base of all systems is the eligibility classification. The central banks which participate in the European System of Central Banks (ESCB) are discussing ways the eligibility procedures should be harmonised, or at least properly compared within the ESCB. Credit or corporate directorates of the participating central banks have carried out guidelines for best practices in corporate risk assessment. Hence, prior to describing the effective methodologies, we shall present a summary of these guidelines [34] that could possibly influence the planned supervisory framework of external ratings.

The in-house risk assessment practices in the ESCB aim at selecting the highest credit quality assets, or "eligibility for tier-two collateral". In addition, central banks' in-house rating departments do not have contractual relationship with rated firms.

- Objectives of the analysis and main characteristics of "sound enterprises": ratings result from the assessment of firms' abilities to meet financial obligations, taking firms' individual and sectoral risks into account. According to this objective, the scope of analysis includes the following: business characteristics, financial analysis, management evaluation, industry and economic environment. This general pattern is consistent with that of rating agencies. The main criteria for eligibility are the following: a favourable market position that entails large cash/earnings generation in proportion to financial expenses, supported by a conservative capital structure and secured access to external financing.

- How the analysis should be conducted in practice: NCBs' guidelines suggest the following steps of analysis:

  – Market position and business characteristics: strengths and weaknesses in competitive position (market share, business strategy, technology etc.), legal status, ownership structure and relationship with affiliated companies.

  – Financial analysis: quality of financial statements, ratios analysis (intrinsic analysis and peer group comparison) regarding the following items: operating cash-flow/external financing, operating cash-flow/financial expenses, short term debts/liquid assets, long term debts/fixed assets, level of profitability (margins, productivity), attractiveness of business for equity investors (cost of capital), financial flexibility (payment behaviour, access to banking and markets funding),

  – General management evaluation and track record,

[34] The final version of these guidelines is still being discussed and a conclusive report is expected to be disclosed within several months.

– Industry and economic environment: firm's ability to sustain business cycles and changes in technological environment.

This analytical framework is processed through computational tools. The results are then subject to a final and conclusive credit assessment that must be issued by an independent credit committee (or equivalent) composed of the bank's senior executives. The assessment must ensure the objectivity of the analysis and the soundness of the analytical tools.

The existing NCBs' rating systems are generally consistent with the above mentioned guidelines as shown in the following examples of France, Germany, and Spain.

Bank of France's rating system and methodology

Among the firms recorded in the BOF's FIBEN database, 180,000 companies release a complete set of information (financial statements, identification of shareholders and managers, etc.), enabling local branches to assign a comprehensive rating. The share of these 180,000 corporates in the total outstanding banking credit to corporates is about 45% of the total outstanding credit identified in the BOF's Credit Register. BOF analysts also use consolidated financial statements covering 2,500 groups, information on ownership structures, and reports on payment defaults.

The BOF's rating system is based on a comprehensive assessment which is disclosed through a three-position code. Each position stands for the size, the overall credit quality, and the regularity of payments to vendors and banks. See Table VI for the rating "notches" and rationale for each one.

The credit quality rating is completed by a management quality rating assigned to individuals acting as general managers and based on public information (see Table VI). A supplementary "transparency indicator" ("T") is awarded to companies that have agreed to an exchange of information with their bank creditors and that, according to that agreement, have given them updated data on their financial position and future prospects. The transparency indicator is independent from the credit quality, but it is not compatible with an "unknown company" rating ("0" rating).

Another indicator ("R") points out companies that do not comply with the legal financial disclosure framework, such as late filling of financial statements.

The BOF's ratings result from a strictly judgmental approach following the above mentioned rationale. The rationale is detailed and standardised in a reference manual of 200 pages, with 5 updates carried out since 1994. The computational tools are used as decision-making systems, but these tools do not replace the analytical framework itself. The rating offers an overall indication of all the collected data on a company. The analysis is performed so as to elaborate an appraisal of the company's short-term soundness over a one or two year period.

The quality and the objectivity of the rating is ensured by the significant volume of human and technical resources allocated to companies' ratings: 1,000 people on staff dedicated to data collection and processing, and rating analysis; the BOF's mainframe resources, including automatic control and warning devices; control of rating analysts by branch managers and internal audits, and systematic track records. In addition, the BOF's independence vis-à-vis any third party is guaranteed by law, according to the EMU standards. A rating manual is also available.

Bundesbank's rating methodology

The German system relies more on automated processes than the French one. This aspect will be analysed in more detail later and only the standardised analytical approach is presented at that stage.

The first step of the rating procedure consists of drawing up a firm's funds statement, which is derived from the public financial statements. Cash-flow is broken down to track the use of turnover flows, capital expenditure and disinvestment, and the resulting surplus/deficit. The result is a key indicator to assess soundness of firms.

The second step is peer-group comparison. Each peer group is sub-divided by tranches according to volume of turnover. Then, the analysis is conducted through an automated procedure using a list of ratios reported in Table VI. Despite an extensive use of computerised analysis, the final credit assessment is made by the Bundesbank's branch managers, who are requested to add any data not available in the automated system. They are also requested to check that the results are plausible and take any specificity into account. These ratings are then disclosed to subscribing banks and to the rated firms.

Bank of Spain's rating methodology

The BOS started performing in-house risk assessment in 1997. The main objective was to enlarge the set of eligible assets. As a matter of fact, international rating agencies assign ratings to few Spanish companies, even among the most important ones. The BOS holds an extensive database ("Central de Balances") including 170,000 comprehensive financial statements and has performed detailed analysis for a long time but without setting a formal assessment system until 1997. At the present stage, the BOS's credit analysis department (Operations Department) has restricted the scope of analysis to 48 large firms (most of them issuing the most liquid shares and securities on the Spanish markets).

The analytical approach is only judgmental and it is based on a ready-to-assess report which summarises the relevant information combining data from the CCR and the CFSD. This summary includes the following items:

- Financial statements with a preliminary ratios analysis: balance sheet structure and peer groups comparison, estimated current level of profits.
- Last years material changes in the company's situation (capital structure, business lines, mergers, strategic alliances).
- Ratios over the last four years (profit/net assets, capital recovery ratio, financing cost, structure of indebtedness).
- Risks data: concentration of banking exposures on the company, event of bankruptcy.
- Auditors' reports and external ratings.

The analysis is based on a long-term perspective (rather "through the business cycle" than "point in time") and is concluded by a four possible credit quality assignment: levels 1 and 2 correspond to "high credit quality" and "good credit quality", level 3 corresponds to a

"dubious zone" which warns about lack of relevant information, and level 4 corresponds to risky firms. The final rating is decided by a credit committee bound to a full consensus. The rating is then endorsed by the BOS's Executive Council.

The BOS intends to extend its work toward statistical analysis of bankruptcy risk over a sample of about 1,000 companies.

Analytical tools and computation techniques

The rating methodologies described above are carried out with the extensive use of automated computation tools. This can be seen as leading to a trade-off between human thinking and computer processing. All the institutions under review use or intend to use automated computation at least for research, and possibly as effective decision-making systems. Different mathematical techniques are potentially useful to implement automated rating analysis (discriminant linear analysis, probit-logit models, rules-based expert systems (RBES), neural networks, decision-trees etc.). The most commonly used techniques by the institutions under review are discriminant analysis and RBES. We shall focus on the discriminant analysis performed by the Bundesbank, the BOF and the BOI, and on the RBES implemented by the two former institutions [35].

The Bank of France's scoring model

The BOF's Corporate Directorate (Companies Observatory Dept.) has realised a probabilistic corporate scoring model, the "BDFSCORE"[36], based on a statistical analysis of the BOF's CFSD FIBEN. This scoring is neither a substitute for the judgmental rating nor a fully integrated stage within the course of the rating process. It is rather a component of the analysts' toolbox for corporate risk assessment. The model is based on CFSD's financial data (the same base that is used for rating process) combined with public defaults statistics. The model was elaborated using the Fisher discriminant analysis because of its robustness, easy interpretability, probabilistic utilisation, and easy maintenance. The target of such an analysis is to reach the optimum frontier splitting failed and non-failed companies. The optimum frontier results from the best-fitted weighted combination of risk-meaningful ratios (the ratios are defined in Table VI). The "raw results" of the scoring consist of a note more or less close to the threshold distinguishing the failed from the non-failed companies. The risk assessment-oriented nature of the model is enhanced by calculating the posterior probability of failure according to the Bayesian theorem. It enables the classification of companies in risk classes related to a probability of failure expressed in percentage. The chosen time horizon is three years. The model is used to perform individual risk assessment, sector-based risk assessment , risk level individual trajectories tracked year by year, and transition matrices in risk classes. The scoring function is available in several versions fitted to economic sectors (manufacturing, trade, transports etc.).

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[35] Other techniques, especially neural networks, have been tried but are not integrated in the effective rating process.

[36] For a technical description see "Detecting the Risk of Company Failure at the Bank of France", M. Bardos, Journal of Banking and Finance # 22, 1998.

Given the optimal size of the FIBEN database and the reliability of data, it has been seen that the scoring model is efficient and several new related tools are in development. In addition to individual corporate assessment and economic research, the scores have been successfully combined with CCR's risk exposure and integrated within the supervisory risk appraisal system SAABA.

In addition to the scoring model, the BOF has realised a RBES ("GEODE") using the standard judgmental rationale and statistically proven quantitative elements. The results are used as an internal complementary decision-making tool and are sold to companies' managers.

Bundesbank's automated creditworthiness system

The Bundesbank's tools are similar to those used by the Bank of France (for discriminant ratios, see Table VI). Nonetheless, the German system is particular since the scoring and RBES are formally integrated in the rating process itself and constitute a kind of "analytical package". The scoring is computed on a set of quantitative and qualitative data; a specific function is designed for each of the following sectors: manufacturing, trade, and other sectors. The probability of failure is measured by the distance of each company to the cut-off point between fair and risky companies.

The scoring results show 20% of the companies scored are 'neutral'. Statistical results are then refined through the RBES, which reduces the share of the neutral group (i.e. undefined in terms of risk) down to 6%. The German RBES is designed to cope with "fuzzy logic" and contributes to standardise qualitative data. The RBES enhances or mitigates original statistical scores but cannot contradict the initial results. The final rating is assigned on a judgmental basis.

Bank of Italy's automated creditworthiness system

The BOI's supervision department has developed a corporate scoring system based on a logit regression, which is used for research and for off-site prudential review of banking portfolios. Its use for assessing banks' internal rating systems is under consideration. Centrale dei bilanci has also set a different corporate scoring model with a default probability function. This score is provided together with the data on the financial statements to associated banks and to the BOI.

Examples of Similar Rating and Scoring Services Provided by Private Credit Assessment Agencies

These examples do not cover exhaustively the available private risk information services in Europe. Indeed, this topic would require itself a specific and extended study. However, it is interesting to present a few representative examples. The following discussion will focus on three cases: a public scoring carried out by a French business association, and two major CAAs. One of the CAAs is affiliated with a leading international information group; the other is affiliated with a leading European group.

The AFDCC scoring

The French Association of Credit Managers (AFDCC) is an association of professionals involved in credit management, especially in companies that manage their financial relationships with their customers and vendors. The AFDCC has developed a scoring function aimed at classifying small- and medium-size companies. It is free and publicly released. It is used extensively by corporate credit managers whose available resources for credit risk modelling are generally limited.

The first AFDCC's scoring was disclosed in 1992. It was based on a limited sample of 2,000 corporates and did not take sectoral and size differences into account. A new scoring function was released in February 1999[37]. The database has been enlarged to cover 220,000 companies and updated with data from 1994 to 1996. The scoring now includes eleven specific functions taking sectors and business volumes peculiarities into account. As the previously mentioned scorings, scores can be expressed in terms of default probability expressing a bankruptcy risk at a 1.5-year time horizon. Hence, it could be considered a useful benchmark of corporate credit risk assessment. But one should remain cautious at the present stage before concluding on this topic. Indeed, some aspects have to be discussed:

- The sample on which the scoring is based was provided by SCRL, a major CAA. The database includes 250,000 companies on which SCRL has collected comprehensive information and conducted a rating. Although this base seems to be as large as that of the BOF on the same population (French corporates), the effective coverage of the SCRL's could be much more narrow: among the 250,000 firms, 220,000 constitute the scoring sample of which 150,000 companies have a turnover ranging from FRF 1 million to 10 million; and 70,000 ranging from FRF 10 million to 100 million. The coverage is not strictly comparable with that of the BOF (companies with more than FRF 5 million in turnover) but it seems that the "1-10" group of 150,000 companies is far from covering the whole effective number of companies of that size.

- The goodness-of-fit of the function seems equivalent to that of the BOF's scoring (about 80% of successful back-testing). But the "real" quality of the AFDCC's scoring is difficult to assess since the scoring functions were computed on randomly selected sub-samples of about 10,000 companies. In addition, the goodness-of-fit was only determined on these samples and not on a broader scope. Therefore, the scoring function modelizes satisfactorily the scoring sample itself, but there is no further evidence for the bulk of the small- and medium-sized companies.

COFACE-SCRL

COFACE-SCRL claims to be the first French CAA with a database including information on 4 million French businesses [38] and 13 million European firms. However, as mentioned about

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[37] "Le score AFDCC 2, principes de construction et guide d'utilisation", M. Dietsch, Centre d'Etude des Politiques Financières, Feb. 1999.

[38] As there are about 2.5 million French corporates, this figure should also include individual entrepreneurs which are not "incorporated" i.e. their business is not legally embodied in a company status.

the AFDCC's scoring, the SCRL database of companies rated on a comprehensive basis seems to be limited to 250,000 firms. SCRL has commercial relationships with 14,000 customers, mainly firms seeking information on their own customers and vendors. SCRL releases two different credit quality analyses to its customers. One analysis is a computer-based rating generated by a RBES, which replicates the SCRL's rating rationale. The other is an efficiency note, which measures the distance between a company and the "efficiency frontier". The efficiency frontier is the axis or the curve of the businesses' input-output relationships, expressing the best observed output maximisation given a certain input, or input minimisation for a given output. Ratings disclosure is restricted to the subscribers.

The coverage ratio of the RBES rating is not disclosed and that of the efficiency note encompasses 350,000 French companies of which turnover ranges from FRF 1 million to 1 billion. Insofar as SCRL encounters competition, its in-house methodo logy is not publicly disclosed.

DUN & BRADSTREET

D&B covers 4 million French companies and 19 million European companies, but the effective coverage (comprehensive information) has not been disclosed. D&B is supported by an international network headquartered in the United States. One of the group's affiliates is the rating agency Moody's Investor Service, but Moody's officials say D&B and Moody's do not exchange data or methodological advices. D&B sells ratings generated by a scoring based on a discriminant analysis and a RBES, and sells finance decision-making and management products. The models' parameters, databases and quality tests have not been disclosed.

Ratings and Corporate Defaults

The quantitative review of the statistical relationship between the different above mentioned rating systems, especially those based on CFSDs, is beyond the scope of this study. Some quantitative analysis has already been done within the course of building probabilistic scoring systems. However, at this stage, the main question is whether it is possible to establish a mapping of the multiple rating frameworks, that is, to compare and harmonise these different frameworks in terms of default predictability. This issue is being tackled by Credit Directorates of the Central Banks members of the ESCB to implement compatible standards for determining the eligibility of corporate debt instruments as collateral of ESCB's funding.

Definitions of default across countries

Some discrepancies may exist across countries regarding the meaning of the term "default" while other discrepancies may exist among reporting frameworks and default databases. The notion of "default" may refer to payment default or it may refer to the various legal definitions of default.

Definitions of payment default

- Unpaid obligations on due date: this could result from a technical event (e.g. disruption in transfer of digital data, administrative mistake etc.), a trade conflict (a corporate customer which refuses to pay an unsatisfactory product or service or a

delay in delivery), a temporary liquidity shortage etc. It refers in general to lagged payments no longer than the minimum prudential regulatory duration of a delinquent or doubtful asset (generally three months, unless a litigation process is opened meanwhile),

- Doubtful or delinquent asset: after a regulatory duration (three months) or after beginning litigation of any kind at any time either on a contractual basis (declaration of an event of default as defined in the financing contract, acceleration of the loan) or on the basis of a court's decision. It corresponds to the prudential definition of default which is not strictly litigation-based, albeit litigation cases are included therein.

- Insolvency: the debtor is globally unable to cover its financial obligations. It does not necessarily result in legally stated bankruptcy. In some countries, like Germany, insolvency does not lead to legal bankruptcy three times out of four because of the priority given to negotiated settlements/treatment of defaults over court action. Nevertheless, insolvency is publicly known and legally defined. In France, if it is possible, the Commercial Courts conduct amicable negotiations under strict confidentiality. This may concern doubtful assets as well as late payments.

Definitions of legal bankruptcy

The definition of legal bankruptcy depends on the provisions of the trade or bankruptcy law in each country. The common characteristic of all legal environments is that event of bankruptcy are triggered by a formal declaration of such an event to a court.

In France, bankruptcy is a two-step procedure: the company has to declare itself unable to meet any financial obligations (complete breach of payment obligations) before the court opens formally a judiciary bankruptcy procedure. After looking at the company's situation, the court is empowered either to enforce a judiciary recovery plan, or to declare the winding up of operations. The winding up of operations occurs in the majority of cases. All courts' decisions are publicly disclosed and collected by statistical institutes, either state-owned or private, depending on the country.

Whatever the definition of default, it is worthwhile underlining that events of bankruptcy do not result from strictly mechanical processes. They are influenced by the debtor company's behaviour and by that of the court, especially regarding the duration of the procedure and the assessment of the debtor's situation vis-à-vis the creditors. In addition, creditors are strongly encouraged or deterred from declaring the acceleration of loans and a litigation process not only by the effective situation of the debtor but also by the size of the company (large firms generally avoid court action), and provisions of the bankruptcy law.

As a result, defaults reported in CCRs or CFSDs do not express the same economic information. In Austria, France and Germany, CCRs and CFSDs include events of bankruptcy (legal procedures). In addition, the French CFSD reports payment defaults (first definition) through the payment quality grade included in the ratings. This notion of default includes technical events and trade conflicts. The BOF's analysts collect track records on payment default and appraise the quality of payment on a case by case basis to distinguish technical events from temporary liquidity shortages and insolvency cases. The Italian and the Spanish CCRs refer to doubtful/impaired loans and thus they stick to the prudential approach of default. In addition, legal bankruptcies and insolvency situations are included in the CCRs.

Bankruptcy data are more suitable for issuer/borrower ratings than for issue/loan ratings, whereas default data (broad definition, including events different from bankruptcy) are more suitable for issue/loan ratings. All of the reviewed rating systems are based on borrower ratings, which have straightforward associations with bankruptcy risk levels. In addition, it is consistent with the nature of the bulk of companies rated through CFSDs and CCRs i.e. small- and medium-sized companies funded by banking loans or credit lines that are held by banks until repayment dates. In this respect, bankruptcy cases provide critical information given the nature of the borrowers (more exposed to bankruptcy risk than large corporates) and of the assets (non-negotiable). This does not undermine the usefulness of default data, which can help spot structural corporate weaknesses.

Perimeters of reference samples

Theoretically, the best reference sample is most or all companies. Although it should be straightforward, the sample is not simply identifying and collecting data on all existing firms. First, the notion of company may differ across countries and across databases. There is also the question of how to treat partnerships, single-shareholder companies, special purpose vehicles, government agencies established under a "quasi-corporate" status, and individual entrepreneurs, etc.

Moreover, statistical institutes sometimes cannot identify precisely the incorporated companies that have ceased any effective business but are still formally registered. It is necessary to ensure that reference samples are comparable from one country to another.

Relevant time horizons for comparing default statistics

Default rates are estimated throughout a certain time horizon that should be consistent with the rating time horizon. Theoretically, the default risk increases with the time horizon. The definition of the time period may be arrived at through different approaches:

- The starting date is fixed at any time for a set of multiple companies classified according to their rating. Therefore, the starting date is the same for all the companies and the cumulated default rates are determined for the following years. For each class of rating, with a starting date on year *n*, the cumulated defaults at year end *n+1* are deducted from the original population of companies [39], then the same process is repeated at year *n+2* .etc.

- The starting date is the rating assignment date, associated to the financial statements as of the same date. It is observed whether the rated companies default within the following year, the second following year, etc., depending on the time horizon. According to this approach, the starting date and the following scrutinised period may be different for each company. This approach is suitable for matching the financial statements and the rating and, with a fast paced rating updates, for assessing

[39] It corresponds to a bankruptcy-risk approach.

the relationship between shifts in rating levels and the disclosure of financial statements.

- The starting date is the default (bankruptcy) date: it is a backward analysis to estimate the relationship between the event of default and the previous rating (the previous year for a one-year time horizon etc.). The non-defaulted companies have to be introduced to the sample to estimate a global default rate.

These three approaches are possible ways to evaluating the rating systems performance with regards to default predictability. Studies performed by working groups on harmonisation of eligibility criteria in the ESCB have similar results for the first two approaches.

Criteria of an efficient rating system

An efficient rating system should highlight a negative correlation between best quality ratings and the default/bankruptcy rate. The difficulty is in establishing a common standard valuable across multiple countries. Moreover, the share of small businesses influences the bankruptcy rate. In Austria, France, and Germany, some studies show that the larger the companies, the lower the bankruptcy rate.[40] If the legal environment does contribute sometimes to legal bankruptcy in cases of default, then small companies are more vulnerable in this context [41]. When the rate of doubtful assets is taken into account, as in Spain, the size effect could be less clear because medium and large companies are more exposed to lagged payments than to legal bankruptcy. That narrows the gap between small and large companies.

The efficiency of rating systems also depends on transition matrices which should be looked at according to the following criteria:

- Stability: a rating should be stable throughout the time horizon on which it is supposed to give a risk assessment. For example, if a rating is valuable for a one-year time horizon, few rating changes should occur within this period.

- Sensitivity: it is not contradictory with the previous criteria; ratings should respond to any change in the company's situation. High or good quality ratings should be downgraded sufficiently early before any event of default. Therefore, an unstable transition matrix should be jointly observed with a high average default rate.

Interpreting transition matrices require long track records and high frequency information on time periods preceding defaults.

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[40] "Risque et taille des entreprises industrielles", M. Bardos, 1998.

[41] For a different context, see the Chapter 1 1 issue in the US.

European Central Credit Registers and Central Financial Statements Databases: Comparison of The Different Existing Frameworks

Tables I to IV: Central Credit Registers

Table I: Reporting banks and other financial institutions

Reporting institutions	Austria	Belgium	France	Germany	Italy	Portugal	Spain
Reporting institutions incorporated under national regulations							
Credit Institutions: exposures declared by Head Office	X	X	X	X	X	X	X
Credit Institutions: exposures declared by foreign branches	X	X		X	X [42]		X
Leasing and factoring companies [43]	X		X	X [44]	X	X	
Insurance companies: exposures declared by Head Office	X			X			
Insurance companies: exposures declared by foreign branches	X			X			
Other reporting institutions: Social Welfare and Federal Labour Office				X			
Venture capital, national economic recovery invest. Fund [45]				X			
Credit cards issued by non-financ.corp.						X	
Central Bank							X
Deposits insurance or guarantee fund, mutual guarantee funds							X
European branches of foreign banking groups							
Credit institutions	X	X	X	X	X	X	X
Leasing and factoring cos			X				X
Central Bank, deposits insurance or guarantee fund, mutual guarantee funds							X
Foreign institutions under the regime of freedom of services offering [46]							
Credit institutions	X		X				
Leasing and factoring cos			X				
Foreign subsidiaries of domestic institutions							
Credit institutions				X			

[42] Italy: only loans granted from abroad to Italian counterparties.

[43] Austria: including loans granted by domestic banks' foreign branches. Spain and Portugal: leasing and factoring companies are considered credit institutions.

[44] Factoring companies report directly to the CCR whatever the nature of their main shareholder(s). On the contrary, leasing companies are subject to the German CCR reporting only if these companies are banking subsidiaries.

[45] Germany: including loans granted by dome stic banks' foreign branches.

[46] Offering services is allowed if the provider is incorporated as a credit institution in its home-country. (e.g. some German leasing companies are not considered credit institutions).

Table II: Categories of borrowers

	Austria	Belgium	France	Germany	Italy	Portugal	Spain
Database coverage							
Number of borrowers	95,000	425,000	600,000	270,000	1,600,000	3,400,000	10,000,000
Of which corporates (opposed to indiv. entrep. or households)	35,000	160,000	580,000	170,000	N.A	400,000	620,000
Categories of borrowers (domestic and foreign)							
Corporates	X	X	X	X	X [47]	X	X
Credit institutions	X		X (only foreign ones)	X	X		
Public administrations	X [48]	X [49]	X	X (only foreign ones)	X	X	X
Households		X			X	X	
Credit institutions general managers and their family				X			
Non-financial guarantors					X		X

[47] Italy: only loans granted from abroad t o Italian counterparties.

[48] Only local authorities.

[49] Except financings to the Kingdom of Belgium.

Table III: Categories of reported financing instruments and reports periodicity

	Austria	Belgium	France	Germany	Italy	Portugal	Spain
Loans (drawn amount)	Monthly	Quarterly[50]	Monthly	Quarterly	Monthly	Monthly	Monthly
Total financing (including undrawn amount)	Monthly	Monthly	Monthly		Monthly		Monthly
Guarantees (granted)	Monthly		Monthly	Quarterly	Monthly		Monthly
Guarantees (received)[51]					Monthly		Monthly
Collateral and pledge (risk-mitigating)					Monthly		
Derivatives	Monthly[52]		Monthly[53]	Quarterly[54]	To be implemented		
Securitised loans			Monthly				
Fixed-income securities							Monthly
Additional information		Event of bankruptcy	BoF's rating, F/S, event of payment default, event of bankruptcy	Event of bankruptcy, maturity of mortgage loans and of loans granted by public authorities	Impaired loans, unauthorised overdrafts		Initial maturity, impaired loans

[50] Exposures on foreign counterparties: the drawn amount is not reported and the only instrument categories of cash advances and confirmed credit lines are reported.

[51] Stand-alone guarantees or risk-mitigating guarantees attached to a credit exposure.

[52] Indication of existence of swap transactions without any valuation.

[53] Indication of existence of swap transactions without any valuation.

[54] Valuation (credit equivalent) included.

Table IV: Reporting thresholds

	Austria	Belgium	France	Germany	Italy	Portugal	Spain
General threshold							
	ATS 5,000,000; = EUR 363,364	BEF 1,000,000 = EUR 24,789	FRF 500,000 = EUR 76,225	DEM 3,000,000 = EUR 1,533,876	ITL 150,000,000 = EUR 77,469	NIL	ESP 1,000,000 = EUR 6,010 for domestic counterparties, ESP 50,000,000 = EUR 300,506 for foreign counterparties
Special thresholds							
		BEF 100,000,000 = EUR 2,478,935 for exposures reported by the domestic banks' foreign branches		DEM 250,000 = EUR 127,823 for loans to banks' general managers and their families	No threshold for impaired loans	PTE 5,000,000 = EUR 24,940 for households	ESP 10,000,000 = EUR 60,101 for funding of Spanish corp. business abroad and guarantors, ESP 1,000,000 = EUR 6,010 for ailing foreign counterparties
Thresholds are related to	Individual borrowers	Individual borrowers	Individual borrowers	Groups of borrowers with common interests or linked to each other [ro]	Individual borrowers	Individual borrowers	Individual borrowers

Table V: Financial statements databases/coverage ratio

France

Turnover in FRF mn	% in total number of firms	% of outstanding credit	% of total employed staff	
< 5	62.8	9.5	12.4	non-included in the FIBEN's scope
5-100	34.5	27.2	39.6	)
100-250	1.7	13.6	11.0	)FIBEN's scope
>250	1.0	49.7	37.0	)
Total FIBEN	**37.2**	**90.5**	**87.6**	**)**

France (FIBEN)	Sectors breakdown % in no. of cos
Manufacturing	28%
Trade	36%
Building	11%
Transport	5%
Services	20%

Germany

Coverage in % of total B/S amount	**Average ratio = 60%**	Average ratio "West Germany" = 60%	Average ratio "East Germany" = 25%		
According to legal status		% in eco.sectors total turnover		By size of B/S	
		manufacturing	70%		
Ltd companies	75%	trade	50%	up to DEM 10 mn	10%
Partnerships	50%	construction	25%	10-100	60%
Individual entrepreneurs	10%	services	N.S	>100	80%

Austria

Sector	Number of companies	Breakdown % in number of cos	Coverage as a % of turnover
Total	**6890**	**100%**	**33%**
Energy	45	1%	81%
Manufacturing	2554	37%	54%
Trade	2358	34%	27%
Construction	856	12%	25%
Transport, communications	410	6%	26%
Other services	667	10%	6%

Spain (CBA)

	Large cos database = 8,000 cos i.e. 1% total number of cos	
Sector	Coverage in % of GDP	Coverage as a % of turnover
Total	**N.A.**	**36%**
Energy	80%	90%
Manufacturing	35%	45%
Trade	10%	25%
Construction	15%	30%
Transport, communications	60%	20%
Other services	5%	10%

Spain

	Sample breakdown	(size criteria)
Net turnover	% of companies	% of net turnover
> EUR 40 mn	11	84
7-40	25	12
< 7	64	4
Total	100	100

Portugal

Sectors	Coverage ratio in no. of firms	Coverage ratio in % of turnover
Energy	26%	N.A.
Manufacturing	25%	56%
Trade	22%	43%
Construction	22%	43%
Transports, communications	20%	70%
Other sectors	30%	35%

Belgium

Breakdown by sector in % of value added	
Energy	7%
Manufacturing	40%
Trade	20%
Construction	5%
Transports, communications	12%
Other sectors	16%
Total	100%

(the reported number of corp. corresponds to a part of the total population of corp. in each above listed country)

BACH European Financial Database

	Austria	Belgium	France	Germany	Italy	Netherlands	Portugal	Spain
No of corp. in the database	3,500	140,000	33,000	22,000	21,000	82,000	12,000	7,500

Table VI: Rating and scoring methods

BOF's rating classes

- Size in terms of turnover:

  A: > FRF 5 bn

  B: > FRF 1 bn < FRF 5 bn

  C: > FRF 500 mn < FRF 1 bn

  D: > FRF 200 mn < FRF 500 mn

  E: > FRF 100 mn < FRF 200 mn

  F: > FRF 50 mn < FRF 100 mn

  G: > FRF 10 mn < FRF 50 mn

  H: > FRF 5 mn < FRF 10 mn

  J: < FRF 5 mn

  N: non-significant (e.g. holding cos or non-business activities)

  X: unknown

Overall credit quality

0: Financial statements = N.A. without any defavorable information, especially regarding payments.

3: High credit quality, the company is able to fulfil its financial obligations.

4: Good credit with one weakness evidenced: either low profitability, or low EBIT/financial expenses, or low capital/total funding ratio, or narrow S/T liquidity or low-rated management.

5: Low credit quality related to either occurrence of losses, negative cash-flows, occurrence of some payment defaults, negative rating of prominent shareholders or managers, the company owns majority stakes in ailing companies.

6: High risk credit rating related to cumulated losses over more than 3 fiscal years, EBIT absorbed by financial expenses, formal declaration of default, etc.

Payments quality

7: No defaults.

8: Some defaults but no threats to the overall credit quality.

9: Serious cash shortage resulting from a downgraded financial position.

Examples of rating: C37, X07, etc. (a credit rating "3" is not compatible with a "9" payments rating).

Management quality

0: The information collected by the Bank of France on general managers gives no cause of concern.

5: This information gives cause for concern. It corresponds to the following situations: (1) the company is not legally bankrupt but shows a distressed situation and a seriously deteriorated cash position; (2) the company has encountered a judicial liquidation within the last 5 years; (3) the rated managers are legal representatives of companies showing a distressed cash position.

6: This information gives serious cause for concern. It corresponds to the following situations: (1) the managers are personally subject to judicial liquidation or disqualification from management; (2) the managers are legal representatives of at least 2 companies under liquidation procedures or 1 company in which the managers own a more than 90% stake; (3) the managers are by directed by a court to bear a large proportion of the liabilities of the company; (4) the managers show frequent large personal payment defaults.

The BOF's scoring model

Discriminant ratios used for risk assessment

– Profitability

– Unpaid taxes

– Vendors' lagged payments (trade debts)

– Financial indebtedness

– Structure of financial indebtedness

– Cost of financial indebtedness

Bundesbank's Rating Methodology

Discriminant ratios used for risk assessment

Sector	Ratios used for each sector
Manufacturing	– equity+pension provisions/capital employed – return on capital employed (EBIT/capital employed) – return on equity (net profit before tax/equity) – net interest earning (resp.expense)/invested capital – accounting practice (qualitative)
Wholesale/retail trade	– equity ratio (adjusted equity/capital employed) – return on equity (net profit before tax/equity) – capital recovery rate – accounting practice (qualitative)
Other sectors	– equity ratio (adjusted equity/capital employed) – return on equity (net profit before tax/equity) – capital recovery rate – accounting practice (qualitative)

The BOI's scoring model

Discriminant ratios used for risk assessment

– Financial structure and equilibrium

– Liquidity

– Gross profitability

– Net interest expenses

– Capital expenditure

Alternative Rating Methodologies

As mentioned above, the NCBs' rating methodologies basically serve to estimate companies' abilities to sustain their financial obligations. Business environments and the evolution of equity values are only components of a global analysis of all items that may adversely affect firms' abilities to cover their debt service. In this respect, the institutions under review have not yet used alternative valuation techniques. These techniques are derived mainly from equity investment analysis, but they could be adapted to credit risk analysis. As these techniques are not effectively practised, we shall limit the analysis. However, one should keep in mind that some of these techniques have already been introduced in some credit risk management systems and cannot be ignored in the process of setting up a new capital framework.

Different versions of equity-based corporate models

The dividend discount model (DDL) model is based on the basic assumption that the value of a firm is equal to the sum of the actualised future dividends paid by the firm. Equity valuation

is not the primary goal of a credit risk analysis. Indeed, equity valuation may be considered a significant variable for bankruptcy risk analysis since insolvency results from vanishing net asset value as the value of external debts exceed that of the gross assets.

The two main attempts to design an effective DDL model are the Gordon-Shapiro and the Bates models. These are attempts to establish the relevant parameters of the model, especially the modelling of future net profits from which future dividends are deduced. These models test different hypothesis regarding the shape of profit growth curve, either constant or correlated to external variables like the GDP growth rate. Basically, such models provide a theoretical equity yield rate which can be compared with other indices (average stock market yield or risk-free rate) to appraise a risk premium, which may correspond to a global risk measure of a company.

The economic value added (EVA) model has been developed by two consultants, J. Stern and B. Stewart. This technique also derives from the DDL model insofar as it is based on the "value creation" estimated as the gap between Net Operating Profit After Tax and the capital charge. NOPAT can be described as "cash-flow based net earnings" resulting from re-introduction of amortisation in operating flows and of substitution of loan loss reserves by net charge-offs/write-offs. The capital charge is the amount resulting from the cost of capital applied to the capital invested by the equityholders. This is the risk-adjusted yield required by the equityholders to cover their investment. It derives precisely from the above mentioned risk premium.

Option-pricing based models

The best known option-pricing model is the KMV model. The basic assumption is that equity is a call option on the total gross assets of the firm, with a strike price equal to the book value of the liabilities.[55] The model, called Credit Monitor, derives from the market value and the volatility of equity, and from the book value of liabilities the implied optional value of the firm's underlying assets and their volatility. It is a similar process to determining options implied volatility from the observed option price. Then, the resulting implied equity value is compared with the "default point", or the value generally ranging between market value and book value of equity at which the company would probably default.[56] The probability of default is defined as the distance between the implied equity value to the default point.

The DDL and EVA models seem either too simplistic or excessively equity investor-oriented to be adapted to external credit risk assessment. The KMV model seems the most promising alternative technique. However, it has some difficulties, especially concerning the availability of data outside the scope of US firms. There is also the need to clarify the concept of "default", which may varying economic or legal definitions. Indeed, this is a more general problem which every assessment model is to encounter.

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55 "KMV™ Corporation - Modeling Default Risk" P. Crosbie, 1997.

56 The "default point" derives from observed statistics of default correlated with statistics of equity value.

Section B. Export Credit Ratings for Sovereigns

Introduction

In its June 1999 consultative paper on a new capital adequacy framework, the Basel Committee proposes replacing the current approach for claims on sovereigns and central banks with a new system. That new system would permit the "risk weights applied to such claims to be benchmarked to the assessment results of eligible external credit assessment institutions." For sovereigns in particular, the Committee is also proposing to make use "of other bodies performing similar assessment functions, for example, the export insurance agencies in the G10 countries".

In an effort toward gathering the necessary information before designing such a new framework, the following discussion focuses on the activities of export credit agencies of the G10 countries and the international rules governing them. The information covers the presence of export credit agencies in the G10 countries, the methodologies applied, public availability of credit information, and the consistency of ratings across different agencies. In addition, the country ratings of seven G10 export credit agencies are compared with one another and with those of three rating agencies.

An Overview of Officially Supported Export Credits

Export financial flows, whether direct or insured, are considered very important for the smooth functioning of the international trade system. All major exporting countries have established national programs, by means of public or state backed export credit agencies (ECAs), to assist and protect exporters. The programs provide access to financial and insurance facilities, and reduce both the cost and risk involved in exporting.

The functions and operations of export credit agencies can be split into two main categories: credit insurance, and assistance or involvement in the funding of credits for exports.

An export credit arises whenever a foreign buyer of exported goods and services is allowed to defer payment. Export credits are generally divided into short term (less than two years), medium term (two to five years) and long term (over five years). They may take the form of "supplier credits," which are extended directly by the exporters, or of "buyer credits," where the exporter's bank lends to the buyer (or his bank).

Export credits are insured or guaranteed against a variety of risks incurred by exporters. When a distinction is made between these two terms, a "guarantee" means cover extended to banks, whereas "insurance" is extended directly to exporting firms. The main risks covered are country and commercial risks. Country risk is the assessment of whether a country will service its external debts; commercial risk is the risk of non-payment because of bankruptcy or default of the buyer.

Official support can be restricted to insurance or guarantees against export credit risks (pure cover). Alternatively, or in conjunction with the basic insurance facility, official support may include financial support in the form of direct credits, refinancing, and all form of interest subsidies.

All export credit agencies have put in place a system to insure at least the country risk of providing export credit to foreign buyers. Most of the institutions providing such insurance will also cover the commercial risks and some reinsure such risks taken by private institutions. In addition to insurance activities, most participants are involved in at least one form of official financing support. A variety of solutions evolved with regard to government involvement. The organisation of the institutions providing insurance or financing ranges varies across countries. They may be a section of a ministry, as is the case in Japan; a government agency as in Greece; a semi-public joint stock company as in France; or a private institution operating partly under an agreement with the government as in the Netherlands. These solutions are reflected in the way these organisations are funded: from the budget, special government funds, loans and capital from the government, or shares and bonds. Table 1 lists the export credit agencies of member countries of th e Organization for Economic Cooperation and Development (OECD).[57]

International Cooperation among Export Credit Agencies and the OECD Arrangement

Officially supported export finance is intended to supplement the working of the market. This assistance facilitates trade that would not occur if it depended on commercial financing. Unlike domestic transactions, in fact, international trade has special risks that are difficult for exporters and their commercial banks to assume.

Another reason for providing officially supported export finance is to assist in making export credit terms competitive with those offered by other countries. In countries that wish to improve their exporters' competitive positions on world markets, pressure for easy, or "soft," terms for insurance and credit can be very strong. This recreates the risk of an export credit race among supplier countries through subsidisation. Subsidies can include lowering interest rates and insurance premiums, lengthening repayment periods, and relaxing other credit conditions that do not correspond to prevailing market conditions. In these circumstances, the pattern of trade is distorted and moves away from its most efficient configuration both in countries granting the credits and in those receiving them.

Countries that wish to eliminate subsidies to avoid trade distortion rely on internationally recognised guidelines. Since 1975, subsidised export financing has been regulated by an international agreement, negotiated at OECD in Paris. The agreement was known first as the "Consensus" and subsequently as the "Arrangement".[58] Its main purpose is to "provide a framework for the orderly use of officially supported export credits... (It) seeks to encourage competition among exporters...based on quality and price of goods and services exported rather than on the most favourable officially supported terms".

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[57] Table list taken from OECD Internet site. See also "Export Credit Financing Systems in OECD Member and non-Member Countries," a publication from the OECD. It describes the main features of the systems of government support for export credits in 28 OECD countries and 6 non-members countries.

[58] The "Arrangement on Guidelines for Officially Supported Export Credits" came into being in April 1978 and has been revised repeatedly. It is a "Gentlemen's Agreement" directly among its participants for which the OECD provides secretarial services; it is not, however, an OECD act.

The OECD Arrangement restricts the use of subsidised trade financing that places limitations on the terms and conditions of export credits with repayments terms of two years and more that benefit from official support. Such limitations include minimum cash payments to be made at or before the starting point of credit, maximum repayment terms, minimum interest rates and, from April 1999, minimum premium benchmarks.

The country risk classification and the OECD model

In order to set guarantee or insurance premiums for export credits, ECAs must assess the risk of non-payment. As previously noted, risk assessment is usually divided between country risk and commercial risk. Country risk evaluation is based on sovereign risk (also called political risk) assessment. This involves determining the risk that a loan backed by the importing country's good faith and credit will not be repaid. Once it has determined the country risk, an agency will assess the commercial risk of the project. If covered, commercial risk will be "added on" to the basic country risk.

Until 1983, most agencies had little experience of payment difficulties on sovereign loans. This led them to believe it was unnecessary to maintain large reserves against this debt; consequently, most agencies did not discriminate on premiums across countries. However, following the huge losses due to the LDC debt crisis in 1983-85, the Gulf War and the collapse of the former Soviet Union, most agencies became aware that premium rates were too low, and did not reflect the level of risk involved in lending to the high-risk market. Most agencies then began to adopt a more differentiated premium structure, raising premiums for cover for high-risk markets and lowering them for low-risk markets. At the same time, premiums became more flexible; that is, they adjusted more quickly in response to current developments.

Each agency used to have its own system to assess country risk. Usually there were few differences between them on the evaluations of relative positions of different countries. Agencies consulted together within the Berne Union [59]: if an agency found its assessment of a country's relative risk well out of line with those of other agencies, it would usually review its position. However, agencies did differ widely on their evaluation of the absolute risk of various markets. This led to wide variations in premiums charged by different agencies for the same country, even though most agencies would agree on relative country risks, leaving room for subsidisation. Unlike in the case of interest-rate subsidies, the OECD Arrangement did not provide guidelines to limit subsidies on insurance premiums until April 1999. At that time the OECD Arrangement added a new set of rules, known as the "Knaepen Package." The package aimed to eliminate subsidies and trade distortion by setting minimum premium rates for country and sovereign risks. The minimum premium rates are risk-reflective; that is, they are based on a common reference classification of countries into seven risk categories of risk.

[59] International cooperation in export credit insurance goes back to 1934. In that year four public and private export credit institutions met to form the International Union of Credit and Investment Insurers, more commonly known as the Berne Union. The association sought to reduce commercial risk by exchanging reliable information on foreign buyers, a function it still performs today, when total membership includes 40 agencies of 32 countries. Unlike the OECD Arrangement, which is between governments, the Berne Union is between agencies, many of which are private.

The OECD country risk classification method uses an econometric model based on three groups of quantitative risk indicators, each providing a different score:

- Payment experience of the countries;
- Financial situation (debt/exports; debt/GDP; reserves/import);
- Economic situation (including measures of growth potential, inflation, etc.).

For each country, these three different scores are combined with different and flexible weighting into one risk score. That score is then translated into one of the seven risk categories. To produce the final country risk classification, the quantitative outcome of the model is adjusted to take into account possible qualitative factors, such as political and other factors not considered in the model. If appropriate, the model classification is modified accordingly. Minimum premium benchmarks are established for each of the seven risk categories.

Analysis of Country Classification by Seven ECAs

According to the OECD documents, neither the classification of individual countries nor the list of countries in each category is published. However, in addition to information about the services provided, some agencies do publish their country risk classification on their web sites. Agencies differ when explaining the premiums applied to guarantees for risks in different countries. Some do not mention the OECD guidelines, but refer to their own risk analysis. Others generally mention certain constraints imposed within the framework of international commitments. For example, the EXIM Bank clearly states that the minimum exposure fee level is determined by the OECD country classification.

Data

We examined the classification of the agencies of the G10 countries. Of those, the agencies from France, Canada, Netherlands, and UK do not disclose their classifications in their web sites. So we looked at the data published by the following agencies:

1. DUCROIRE - Belgium
2. HERMES – Germany
3. SACE - Italy
4. EID/MITI - Japan
5. EKN - Sweden
6. ERG - Switzerland
7. EXIM Bank – United States

EID/MITI, EKN, and ERG classify countries into eight groups, instead of the seven of the OECD model. For these agencies, countries included in the first group are all OECD members

that, according to the Arrangement, are not subject to minimum premium benchmarks. In order to obtain seven classes and allow for comparison, countries in the first two classes have been grouped together.

We also compared the seven ECAs' country classifications with the ratings assigned by three major rating agencies: Moody's Investors Service, Standard & Poor's Corp, and Thomson Bankwatch

Country coverage

We examined the 201 countries assessed at least by one of the seven ECAs.[60] Table 2 shows the number of countries rated by each agency. The coverage reflects the importance of export trade in each country. The Belgian agency classifies all 201 countries; the US agency classifies the least number of countries at 153. All seven export agencies rated the same 113 countries; two export agencies rated the same six countries.

Of the 201 countries assessed by the ECAs, 100 are also rated by Moody's, 87 by Thomson and 86 by S&P's; 90 are not rated by any of these three rating agencies.

Consistency across the six ECAs' country classifications

Table 3 shows the rank correlation coefficients among export credit agencies. The coefficients are always very high, ranging from 0.995 (SACE/HERMES) to 0.951 (EXIM/ERG). On average, the German agency HERMES shows the highest degree of correlation with the other five agencies; the EXIM Bank the lowest.

The country risk scores are thus very similar but not identical. This may be due to the downgrading of some country (with respect to the OECD model score) in order to charge a premium above the benchmark rates, an option given to ECAs by the OECD Arrangement.

Consistency between rating agencies and ECAs' country classification

The ECA score for each country was averaged and compared with the rating assigned by the three rating agencies. For each average ECA score, Table 4 shows the frequency distribution of countries according to the rating assigned by Moody's, S&P, and Thomson. For example, 50% of the countries with an average ECA score of 1 that are also rated by Moody's (26) have a rating of Aaa; the remaining 50% has a rating of Aa. In other words, Moody's rates no lower than AA all the countries belonging to the ECAs' lowest-risk class.

Looking across the assessments of the three rating agencies, we observe that:

- The distribution for the three rating agencies is monotonic (with some exceptions): the higher the score, the higher the corresponding rating levels;

[60] ECAs also rate countries like Monaco, San Marino, and the Vatican that were not included in the analysis.

- For each of the seven ECAs' scores, the country ratings are mostly concentrated in two or three adjacent rating agencies' levels;

- The greatest rating dispersion among agencies is noted for S&P in scores six and seven.

The rank correlation coefficient is 0.91 and 0.93, respectively (Table 5). The lower rank correlation coefficient for S&P (0.86) is probably due to the difference in the assessment of the riskiness of the Marshall Islands, which is on average scored six by the export agencies and AAA by S&P's (not rated by the other two).

Conclusion

Export credit agencies exist in all G10 countries. Although they share basically the same economic objectives of export promotion, no two national export agencies are identical. Each agency operates in its own commercial and political environment.

From April 1999, the country risk assessment methodology should be agreed within the framework of the OECD Arrangement for the definition of minimum premium benchmarks. This methodology and the resulting country classification are confidential. However, seven G10 agencies do publish their country risk classifications on their web site. These data show that the consistency of the different country risk assessments is very high, although they are not identical.

All together, the seven G10 export agencies that disclose their country ratings classify the riskiness of 201 countries. Across agencies, the number of countries that are rated differs greatly; this is in line with the different level of importance export trade plays in each country. However, the number of countries rated by the export agencies is much higher than the number of countries rated by three major rating agencies: for 90 countries, ratings are available only from the export agencies. For the 111 countries for which ratings from rating agencies are also available, the ECAs' scores are mostly concentrated in two or three adjacent rating agencies' levels.

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OECD, 1999, "Les systèmes de financement des crédits à l'exportation", Paris

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Ray, J., 1995, "Managing official export credits", Institute for International Economics, Washington, D.C.

Table 1: Export credit agencies of OECD members

Country	Agency
Australia	EFIC - Export Finance and Insurance Corporation
Austria	OeKB - Osterreichische Kontrollbank AG
Belgium	ONDD - Office National du Ducroire
Canada	EDC - Export Development Corporation
Czech Republic	EGAP - Export Guarantees Development Corporation CEB - Czech Export Bank
Denmark	EKF - Eksport Kredit Fondem
Finland	FINNVERA - Finvera Oyj FIDE - FIDE Ltd
France	COFACE - Compagnie Francaise d'Assurance pour le Commerce Exterieur DREE - Direction des relations economiques exterieures
Germany	HERMES - Hermes Kreditversicherungs AG
Hungary	MEHIB - Magyar Exporthitel Biztositò Rt
Italy	SACE - Sezione speciale per l'assicurazione del credito all'esportazione
Japan	EID/MITI - Export Import Insurance Division, Ministry of International Trade and Industry JBIC - Japan Bank for International Cooperation
Korea	KEIC - Korea Export Insurance Corporation KREA EXIM BANK - The Export Import Bank of Korea
Netherlands	NCM - Netherlandsche Credietverzekering Maatschappij NV
Norway	GIEK - The Norwegian Guarantee Institute for Export Credits
Poland	KUKE - Korporacja Ubezpieczen Kredytow
Spain	CESCE - Compania Espanola de Seguros de Credito a la Exportacion SA SEC - Secretaria de Estado de Comercio
Sweden	EKN - Exportkreditnamnden
Switzerland	ERG - Export Risk Guarantee
United Kingdom	ECGD - Export Credits Guarantee Department
USA	EXIM BANK - Export Import Bank of the United States

Table 2: Country coverage (total: 201 countries)

	Rated	Not rated
Export credit agencies		
DUCROIRE *Belgium*	201	0
EID/MITI *Japan*	155	46
EKN *Sweden*	164	37
ERG *Switzerland*	187	14
EXIM *USA*	153	48
HERMES *Germany*	190	11
SACE *Italy*	184	17
Rating agencies		
Moody's	100	101
S&P	86	115
Thomson	87	114

Table 3: Spearman correlation coefficients

(number of observations in brackets)

	SACE	ERG	EKN	EID/MITI	EXIM	DUCROIRE	HERMES
SACE	1 (184)						
ERG	0.99603 (177)	1 (187)					
EKN	0.98840 (161)	0.98862 (159)	1 (164)				
EID/MITI	0.98853 (150)	0.98858 (152)	0.98525 (140)	1 (155)			
EXIM	0.98036 (144)	0.95134 (145)	0.97858 (131)	0.98167 (129)	1 (153)		
DURCOIRE	0.98602 (184)	0.97485 (187)	0.98640 (164)	0.98840 (155)	0.98121 (153)	1 (201)	
HERMES	0.99492 (178)	0.98879 (180)	0.98879 (162)	0.99251 (151)	0.98221 (146)	0.98608 (190)	1 (190)

TABLE 4

Moody's ratings by average ECAs score

	AAA	Aa	A	Baa	Ba	B	Caa
score 1	***0.50***	***0.50***	0.00	0.00	0.00	0.00	0.00
score 2	0.00	0.00	***0.38***	***0.54***	***0.08***	0.00	0.00
score 3	0.00	***0.12***	***0.18***	***0.41***	***0.29***	0.00	0.00
score 4	0.00	0.00	***0.08***	***0.58***	***0.33***	0.00	0.00
score 5	0.00	0.00	0.00	***0.17***	***0.33***	***0.50***	0.00
score 6	0.00	0.00	0.00	0.00	***0.22***	***0.78***	0.00
score 7	0.00	0.00	0.00	0.00	0.00	***0.55***	***0.45***

S&P's ratings by average ECAs score

	AAA	AA	A	BBB	BB	B	CCC	CC	C-D
score 1	***0.48***	***0.48***	***0.04***	0.00	0.00	0.00	0.00	0.00	0.00
score 2	0.00	***0.08***	***0.46***	***0.46***	0.00	0.00	0.00	0.00	0.00
score 3	0.00	***0.08***	***0.25***	***0.33***	***0.33***	0.00	0.00	0.00	0.00
score 4	0.00	0.00	***0.18***	***0.45***	***0.36***	0.00	0.00	0.00	0.00
score 5	0.00	0.00	0.00	***0.18***	***0.27***	***0.55***	0.00	0.00	0.00
score 6	***0.13***	0.00	0.00	0.00	***0.25***	***0.50***	***0.13***	0.00	0.00
score 7	0.00	0.00	0.00	0.00	***0.17***	***0.67***	0.00	0.00	***0.17***

Thomson's ratings by average ECAs score

	AAA	AA	A	BBB	BB	B	CCC	CC	C-D
score 1	***0.45***	***0.55***	0.00	0.00	0.00	0.00	0.00	0.00	0.00
score 2	0.00	0.00	***0.38***	***0.54***	***0.08***	0.00	0.00	0.00	0.00
score 3	0.00	0.00	***0.25***	***0.25***	***0.50***	0.00	0.00	0.00	0.00
score 4	0.00	0.00	***0.09***	***0.18***	***0.73***	0.00	0.00	0.00	0.00
score 5	0.00	0.00	0.00	0.00	***0.40***	***0.50***	***0.10***	0.00	0.00
score 6	0.00	0.00	0.00	0.00	***0.11***	***0.67***	***0.22***	0.00	0.00
score 7	0.00	0.00	0.00	0.00	0.00	***0.50***	***0.20***	***0.10***	***0.20***

Table 5: Spearman correlation coefficients

(number of observations in brackets)

	Moody's	SP	Thomson	Avg ECA
Moody's	1 (100)			
SP	0.94558 (80)	1 (86)		
Thomson	0.95030 (82)	0.95842 (72)	1 (87)	
Avg ECA	0.91227 (100)	0.85957 (86)	0.93016 (87)	1 (201)

Section C. New Products from Rating Agencies

Introduction

One aspect of the evolution of the credit rating industry in the United States is that the diversity of the instruments rated has gone well beyond the long-term corporate bonds that John Moody first started to rate in 1909. Ratings are now assigned to the credit risk of asset-backed securities, bank certificates of deposit, commercial paper and medium-term note programs, sovereign bonds, municipal bonds, preferred stock, private placements, and shelf registrations. The types of risks rated have expanded as well. They now include the counterparty risk of derivative-products companies and other entities, the claims-paying ability of insurance companies, the funding adequacy of pension plans, the performance risk of mortgage servicers, and the price volatility of mutual funds and mortgage-backed securities.

This section focuses on four rating agency products that might possibly serve as complements to more traditional ratings in a regulatory regime that relies on external credit ratings. The first product, issuer ratings, makes it possible to expand the universe of firms with credit ratings beyond those that have issued public debt. The second product, bank loan ratings, adjusts for differences in expected recoveries often observed for bank loans in default relative to bonds in default. The third, bank financial strength ratings, measures stand-alone credit quality and allows an assessment of the dependence on the safety net for any particular set of banks. Finally, sovereign ceilings, which reflect country risk, denote the maximum foreign-currency rating that an entity domiciled in a particular nation can receive, with very few exceptions.

Issuer (Counterparty) Ratings

Three of the major rating agencies produce credit ratings on issuers in addition to credit ratings on instruments or issues. For the purposes of this discussion, the major agencies are Moody's, Standard & Poor's, Thomson Bankwatch, and Fitch, which was formed by the June 1, 2000 merger of Fitch/IBCA with Duff & Phelps, both of which were considered major agencies before the merger. Since 1998, Moody's has published issuer ratings that assess the creditworthiness of a firm, even if the company has no outstanding public debt (Moody's, 1998b). These issuer ratings reflect Moody's opinions on an entity's ability to meet its senior (unsecured) financial obligations. Moody's issuer ratings appear to be a slight adaptation of the agency's previous "counterparty rating" product, which was already in use for nearly 900 issuers, and was more explicitly focussed, at least in name, on default risk in bilateral financial contracts. Similarly, issuer credit ratings can be used as measures of a company's repayment ability under a variety of financial contracts, including swaps, forwards, options, and letters of credit. Indeed, the ratings applications beyond the public debt markets include the extension of credit lines, the provision of information to potential suppliers or customers, and the marketing of derivative products and various other counterparty transactions.

Standard & Poor's also publishes issuer credit ratings. They do not apply to any specific financial instrument, and thus do not depend on the provisions of individual obligations, including their standing in bankruptcy or liquidation, statutory preferences, or legality and enforceability. Both Moody's and S&P use the same symbols for issuer ratings as those used for long-term bonds.

The issuer credit ratings of Thomson Bankwatch are distinct. They are based on the overall health and financial condition of the rated company, and combine pure credit risk (timely payment in full of principal and interest) with performance risk. The scale does not correspond to that of long-term bond ratings, but is instead based on a nine-point scale from A through E, with intermediate ratings of A/B, B/C, C/D, and D/E.

Bank Financial Strength Ratings

Two of the major rating agencies issue a special set of bank ratings based on the "stand-alone" financial strength of the bank. Financial strength ratings, which Moody's introduced in 1995, represent Moody's opinion of a bank's "intrinsic safety and soundness" and exclude external credit risks and credit support elements that are addressed by traditional debt and deposit ratings. Financial strength ratings measure the likelihood that a bank will require assistance from third parties, such as its owners, industry group, or official institutions.

Unlike traditional bond ratings, financial strength ratings do not measure the risk that principal and interest payments will not be made to investors (depositors) on a timely basis. In countries with strong explicit or implicit safety nets protecting investors in bank securities, banks' bond ratings should be higher and exhibit less variation than they would in the absence of government support. Investors may demand financial strength ratings for at least two reasons. One reason is that they may disagree with the rating agency's assessment of the strength of the safety net but would value the agency's opinion on independent financial strength. A second is reason is that they may simply want to avoid exposure to a "bad name" even if the risk of actual credit loss is minimal.

The symbols used for financial strength ratings differ substantively from those used for long-term debt obligations. In contrast to the traditional bond rating scale, financial strength ratings are expressed on a nine-notch scale: A, B+, B, C+, C, D+, D, E+, and E (with no minuses). The mapping from bond ratings to financial strength ratings for individual banks will not be monotonic because Moody's assumes that different types of banks may have different levels of government support.

Fitch issues a similar rating product for banks, which they call "individual ratings". These ratings reflect an opinion on the hypothetical creditworthiness of a bank if it were entirely independent, which can be thought of as the likelihood the bank will run into difficulties that would require external support. These ratings are distinct from the more traditional bank ratings that are inclusive of expected support factors by Fitch. Similar to Moody's symbols, Fitch's individual ratings also range from A to E.

Fitch also issues ratings specifically on the support available to the bank in the event of financial distress, called "support ratings". The individual and support ratings of banks are combined to arrive at its traditional long-term and short-term entity, and senior debt ratings.

Bank financial strength ratings should not be confused with insurance company financial strength ratings, which are also known as claim-paying ability ratings. Such ratings are issued by most of the major credit rating agencies and by at least one firm (A.M. Best) that specialises in insurance ratings. Insurer financial strength ratings, which use symbols identical to long-term bond ratings, measure an insurance company's ability to pay punctually policyholder claims and obligations under its insurance policies and contracts. These ratings

can differ from ratings on specific bonds of an insurance company due to differing seniority levels of obligations to claimholders and of those to bondholders.

Bank Loan Ratings

In the 1990s, three of the major rating agencies began to offer ratings on bank loans, using the same symbols that are used for long-term credit ratings. Bank loan ratings are meant to capture the benefits of seniority, covenants, collateral, and other repayment protections that may accrue specifically to holders of bank debt, in addition to the overall creditworthiness of the firm. Thus, bank loan ratings help creditors to assess the extra protection that may be available to holders of bank loans relative to bondholders or other creditors. In many instances, the bank loan rating will be higher than the borrower's long-term credit rating. For example, in July 1998, in more than one-half of the cases in which Moody's had both bank loan and bond ratings outstanding on a single firm, the bank loans received higher ratings. This is consistent with the significantly higher recovery rates observed for senior secured loans in default relative to bonds in default (Moody's, 1998a).

The bank loan class is growing very rapidly. S&P indicates on its web site that it has more than 900 bank loan ratings outstanding. The incentive to obtain bank loan ratings has been heightened by the increasingly widespread syndication of leveraged loans, since ratings may help syndication reach a broader investor base. In general, the rating agencies appear to design considerable overlap in the staff rating bank loans and bonds for the sake of economising on industry expertise, i.e. teams of industry analysts assign both bond and bank loan ratings. Ratings on bank loans are increasing in non-US markets as well. The methodology for arriving at bank loan ratings is often adjusted to take into account the legal environment and observed recovery experience of the local market in question (Moody's, 1999).

Sovereign Ceilings

All of the major rating agencies apply the sovereign ceiling principle, with varying strictness. In most cases, the sovereign ceiling rating coincides with the foreign currency bond rating assigned to the corresponding national government. However, rating agencies typically assign a sovereign ceiling even when there is no foreign-currency sovereign debt to be rated. For example, Thomson BankWatch applies a sovereign ceiling to its bank ratings, but does not explicitly rate any sovereign bonds. The underlying logic of the sovereign ceiling principle is that a financially distressed sovereign government would be likely to impose exchange controls or otherwise interfere with the ability of domestic firms to service their external debt. The most universal exception to the sovereign ceiling principle occurs in cases when an internationally oriented corporate borrower structures an offshore collateral arrangement under which funds would never enter the country where the firm is domiciled. S&P and Fitch-IBCA are also willing to relax the sovereign ceiling by a few notches for high quality corporate issuers domiciled in low-rated countries with "dollarized" economies, such as Argentina.

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Section D. Published Surveys

Introduction

One issue with the use in regulation of sovereign ratings from established credit ratings agencies is the relative lack of data by which to judge agencies' performances. This is true particularly in the speculative grade arena. Other than a brief period of activity in the 1920s, only since the late 1980s have weaker sovereign credits found market conditions favourable enough to publicly issue bonds in international credit markets. At the end of 1985, only 16 countries had sovereign credit ratings from the major agencies, and most were highly rated OECD countries. By the end of 1997, nearly 100 countries had been assigned sovereign credit ratings, more than 40 within the preceding two years (Bank for International Settlements, 1999).

At the same time, there is a relatively extensive literature on the determinants of the creditworthiness of less developed countries (e.g. Feder and Uy, 1985; Lee, 1993; Haque et al, 1996; Haque et al, 1998; Scholtens, 1999). Most of this literature has not used rating agency credit ratings, due to the relative brevity of available time series data. Instead, it has taken as summary indicators of country risk the country risk ratings published by the business publications *Euromoney* and *Institutional Investor*. A few of the recently published papers have also used the country risk ratings prepared by the Economist Intelligence Unit (EIU), an information service affiliated with the *Economist* magazine.

Institutional Investor, Euromoney, and the EIU

The *Institutional Investor* survey has been running since the late 1970s, and is published semi-annually. The *Institutional Investor* rating is based on a survey obtained from the staff from about the 100 largest banks. The banks rank countries from 1 to 100, with 100 representing those with the smallest chance of default. The *Institutional Investor* weighs each bank response according to a proprietary algorithm that counts the ratings of banks with large world-wide exposure and sophisticated country risk management systems more heavily.

The *Euromoney* country risk ratings have been in publication since 1982, and are also published semi-annually. Rather than a direct reflection of market participants' opinions, *Euromoney*'s country risk rating reflects a combined assessment of country risk by a panel of external experts, including economists and political risk analysts. Experts in different areas rate different indicators, which are weighed according to predetermined formula.

The country risk ratings of the EIU are based on the evaluation of risk by internal staff, and are updated quarterly. Similar to *Euromoney*, the EIU separately evaluates separate elements of country risk including medium-term lending risk, and political and economic policy risk, and then applies a weighting scheme to arrive at a single country risk measure. Table 1 below outlines the criteria underlying the country risk ratings of *Institutional Investor*, *Euromoney*, and the EIU, and Table 2 presents a much more detailed overview of the methodology utilised by each of the three sources.

The literature that utilises the above measures as proxies for country risk arrives at two unsurprising conclusions. First, standard quantitative measures of country risk explain a good deal of the variation in these proxy measures when their influence is estimated in a multivariate regression. In Haque et al (1996), the adjusted R-squared range from .77 for the

Euromoney rankings to .97 for *Institutional Investor* rankings. The study did not examine whether the differences in the adjusted R-squared for the different measures result from differences in the sample of countries, scales of the measures, or in the explanatory power of the risk ratings. By comparison, the adjusted R-squared for a regression of sovereign credit ratings on eight variables for 49 countries was .924 (Cantor and Packer, 1996).

Second, the risk ratings appear to be highly correlated with the market spreads implicit in initial issue pricing or the price of outstanding debt (Feder and Ross, 1982; Scholtens, 1999). This is also similar to the results found for sovereign credit ratings by the established ratings agencies.

Limitations

While the above country risk ratings have been useful for academics investigating the determinants of country risk, there are number of problems with using country risk ratings as complements to agency sovereign credit ratings:

- *Availability:* To serve as good complements to agency sovereign ratings, the country risk ratings should be public. A review of their web sites indicates that while the *Institutional Investor* rankings are freely available, the *Euromoney* and *EIU* rankings require a subscription or contract. These subscriptions run into the hundreds of dollars.

- *Scale:* While country risk ratings are highly correlated with each other and with market-determined credit spreads (and most probably with agency credit ratings). However, there has been no attempt by the publishers or compilers of these country risk ratings to calibrate the scales of measurement to a probability of default and/or expected loss. By contrast, agency sovereign credit ratings are, at least in the case of the largest two agencies, associated with probabilities of default and expected loss. Thus, to utilise the country risk ratings to complement agency sovereign ratings would require an explicit exercise to map their scales into those of the established agencies.

- *Timeliness: Institutional Investor* and *Euromoney* country risk ratings come out on a biannual basis. However, as the financial crisis of 1997-1998 in Asia illustrated, changes in country risk profile can occur within a much shorter time frame. In addition to the relative slow pace of updating, the published country risk ratings are themselves based on interviews and panel discussions conducted months earlier. In the case of *Institutional Investor*, the country risk ratings are based on views expressed five months before they are published (Scholtens, 1999).

Table 1: Criteria Underlying Country Risk Ratings (Haque et al, 1996)

Institutional Investor

Each country graded by 75-100 leading international banks on a scale of 0-100, with 100 representing the least chance of default. Individual responses are weighted using a formula that gives more importance to responses from banks with greater world-wide exposure. Criteria used by the individual banks are not specified.

Euromoney

Each country graded by panels of political risk specialists and economists.

Assessment is supposed to based on three main sets of indicators:

Analytical Indicators	40%	
Political risk		(15)
Economist risk		(10)
Economic indicators		(15)
Credit Indicators	20%	
Payment record		(15)
Rescheduling		(5)
Market Indicators	40%	
Access to bond markets		(15)
Sell-down on short-term paper		(10)
Access to discount available		(15)

Economist Intelligence Unit

Evaluation done by internal staff based on three sets of factors:

Medium-term lending risk	45%
Political and economic policy risk	40%
Short-term trade risk	15%

Source: Table 1 of Haque et al (1996)

Table 2: Detailed methodology underlying country risk analysis (Haque et al, 1996)

Institutional Investor

The *Institutional Investor* country ratings, which were first compiled in 1979, are published semi-annually and are based on evaluations obtained from the staff of about 100 of the largest international commercial banks. Every six months, each bank provides an update of its ratings. The banks are asked to grade countries on a scale of 0-100, with 100 representing those with the smallest chance of default. Banks are not permitted to rate their home countries. The ratings for individual countries are then obtained by weighting individual bank responses according to a formula that gives greater weight to responses from those banks with the largest world-wide loan exposures and most sophisticated systems for analysing country risk. While there is substantial consistency among bankers regarding the attributes that determine the country credit ratings, there are apparently considerable differences regarding the relative importance attached to these attributes by bankers in different countries.

Euromoney

Prior to 1987, the Euromoney risk ratings were based solely on judgmental criteria. The following weights applied: access to international bond markets, 20%; access to trade finance, 10%; external payment record, 15%; rescheduling difficulties, 5%; political risk, 20%; and "sell-down" (a measure of oversubscription of international bond or equity issues), 30%.

In 1987, the methodology was changed to reflect an assessment of country creditworthiness by a panel of experts. For each country, the experts were asked to base their views on an evaluation of three broad sets of indicators: analytical indicators, credit indicators, and market indicators. The analytical indicators were given a weight of 40%, and encompassed an evaluation of political risk (15%), economic risk (10%), and additional economic indicators (15%). Political risk reflects a judgement by political risk specialists regarding the likelihood and the potential effect of any political instability. Economic risk is based on a prospective view of economic performance up to two years ahead, as judged by the panel of economists. The additional economic indicators consist of three ratios, based on historic data: the ratio of debt-service payments to exports, which serves as a measure of short-term liquidity needs; the ratio of external debt to GNP; and the ratio of the balance of payments to GNP. The last two ratios are taken as measures of solvency.

The credit indicators, which have a weight of 20%, are based on a measure of the historical creditworthiness of countries. These indicators are made up of the country's external payment record (15%) and a subjective impression of the ease of any rescheduling that may have taken place in the past (5%). Ease of rescheduling indicates a country's general creditworthiness in the face of temporary liquidity problems.

The market indicators, which attempt to incorporate the information available on the secondary markets for sovereign debt, have a weight of 40% and reflect access to international bond markets (15%), the sell-down on short-term paper (10%), and access to, and discount available on forfeiting (15%). Forfeiting entails the discounting of medium-term

promissory notes or drafts related to an international trade transaction. Repayments are semi-annual, and discounting is at a fixed rate.

Economist Intelligence Unit

The quarterly country creditworthiness ratings prepared by the EIU are based on an evaluation of medium-term lending risk, political and economic policy risks, and short-term trade risk.

Medium-term lending risk is derived from an assessment of the evolution of external indebtedness and trends in the current account. Eight variables are used in assessing this risk: the ratio of total external debt to GDP, total debt-service ratio, interest payments ratios, the ratio of current account to GDP, saving-investment ratio, arrears on international bank loans, recourse to IMF credit, and the degree of reliance on a single export. Each of the variables accounts for 5 points, except the interest payments ratio, which accounts for 10 points. In the classification, zero represents the lowest risk, and 5 (or 10 for the interest payments ratio) represents the highest risk. Thus, a maximum weight of 45 points is possible for this category, indicating maximum risk.

Political and economic policy risk, which carries a maximum weight of 40 points, is more difficult to quantify than the medium-term lending risk. Economic policy risk relates to the quality and consistency of economic management, as well as to the underlying performance of the economy. Fiscal, monetary, and exchange rate policies; attitudes toward foreign investment; and the size and performance of the public sector are given ratings such as “very good” or “poor” and receive a quantitative score.

Political and strategic risks are the most subjective of all the creditworthiness factors considered by the EIU. The aim is to assess the capacity of a government to implement the measures necessary to stabilise the economy and meet its external commitments. The variables considered include, for example, the operation of the political system, the policies likely to be adopted by opposition political parties, the degree of enfranchisement, and policies toward foreign creditors.

Short-term trade risk accounts for 15% of the total score. Two basic factors are considered: the import cover ratio (that is, the ratio of nongold reserve to imports) and the country’s current record on foreign exchange transfers for import payments. An additional factor is whether the country has arrears with multilateral financial institutions.

Source: Table 1 of Haque et al (1996)

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Section E. Measurements of Probability of Default based on Accounting Data

Introduction

The key feature in credit risk models is the measure of the probability of default. Approaches to measuring default probabilities can be divided into two main groups: one consists of measures based on accounting data, while the other uses measures based on market data. This section reviews the main methodologies based on the former, that is, data taken from the financial statements of the borrowing firms.

Traditional financial analysis

The classic methodology for assessing creditworthiness relies on the expertise of banks' financial analysts. Before granting credit to corporate customers, banks' financial analysts examine two types of information: *quantitative data*, such as balance-sheet data describing the economic and financial condition of the firm, and *qualitative data*, such as manager reputation and the state of the sector. The main balance-sheet ratios, measuring profitability, liquidity and solvency, are examined one at a time and sequentially (univariate analysis), by comparing them with average industry ratios and trend norms. The final assessment can be simply an approval/rejection choice or can be the inclusion of the borrower in a rating class. In the latter case it is possible to associate to each rating class the probability of default that was historically experienced by the firms in that class. The main advantage of this approach is also its limit: the analysis is subjective so it can take into account all those qualitative factors that are difficult to quantify. On the other hand, it is difficult to assess the creditworthiness of a firm whose balance-sheet ratios are discordant: a firm may have a poor profitability ratio but an above-average liquidity ratio, and in this case different experts may have different opinions on the same firms.

Statistical analysis: scoring methods

Statistical scoring methods combine and weigh individual accounting ratios to produce a measure - a credit risk score – which best discriminates between healthy and sick firms. The most widely used statistical methods are discriminant linear analysis and probit/logit regression.

Statistical scoring models based on linear discriminant analysis

The classic Fisher linear discriminant analysis seeks to find a linear function of accounting variables that maximises, among these variables, the variance between the two groups of firms while minimising the variance within each group. The variables of the scoring function are generally selected among a large set of accounting ratios on the basis of their statistical significance. The coefficients of the scoring functions represent the contribution (weight) of each ratio to the score. The score can be calculated as the sum of ratio contributions. A firm is assigned to the group whose mean score is closest to the discriminant score. Knowing the prior probabilities of default, the firm's posterior probability of failure can be obtained using

the Bayes' theorem. The classification rule derived from the Fisher function assumes that the prior probabilities of being a good or bad firm are equal.

The performance of the model can be ascertained in two ways. One way is by verifying the classification accuracy, that is, the ability to identify the sick/healthy firms in the sample as such. The second way is verifying the predictive power ex-post by comparing, on a different sample, the specific prediction with the actual outcome.

Classification accuracy can be measured by the misclassification of failed firms (defined as Type I error) and the misclassification of healthy firms (defined as Type II error). Overall accuracy is a combination of both.

The classification rule derived from the Fisher function assumes that the cost of a Type I error (loan loss) is equal to the cost of a Type II error (an opportunity cost). Generally, the cost of a Type I error is viewed as much higher, so the decision rule can be modified and, using a Bayes' decision rule, made a function of the cost of the two different errors.

The linear discriminant analysis is based on two restrictions: One restriction is that the dependent variables must follow a normal distribution. The other is that the variance/covariance matrix of the dependent variables is equal for the two groups of firms. The linear discriminant analysis is the most used in the credit risk measurement literature and has proved to be robust even when these restrictions do not hold, or only partially hold. In addition to the famous applications of Altman, other examples are the system of risk diagnosis of the Banque de France and of the Italian Centrale dei Bilanci. Despite its wide implementation, there are some limitations that this methodology shares with the other statistical methods, which will be discussed next.

Statistical scoring models based on logit regression

The logit analysis uses a set of accounting ratios to predict the probability of borrower default. It assumes the probability of default takes a logistic functional form and is, by definition, constrained to fall between zero and one. In the linear logistic model the dependent variable is the log of the *odd-ratio*, which is assumed to be linearly related to the explanatory variables (the accounting data).

The main advantage of the logistic regression is that it does not require restrictive statistical hypotheses of the variables. In addition, it is possible to assess the relative importance of the different ratios included in the function, using a simple t-test (this is not possible in the discriminant analysis). The main problem is that an increase/decrease in the probability does not always correspond to the same deterioration/improvement in the economic situation of the firm. It is understated when the probability values lie near 0 or 1; it is overstated when the probability values lie near 0.5.

Performance

Table 1 shows the performance of the models most often cited in the literature on the subject. The overall classification accuracy in the sample is generally very high (ranging from 90% to 95%) when estimation samples are made up of very few firms. Accuracy decreases when samples are larger. However, larger samples allow for a better generalisation of the results and in higher accuracy out-of-the sample.

All in all, multivariate accounting-based credit-scoring models have been shown to perform quite well. In particular, linear discriminant analysis seems robust even when the underlying statistical hypothesis does not hold, especially when used on large samples. The results are similar to those produced by the logit analysis. The most recent studies use both methods and choose the one with the best performance out of the sample to avoid problems of sample-specific bias and overfitting.

Discriminant accounting variables

Generally, variables measuring profitability, leverage, capitalisation, and liquidity prove able to discriminate between sick and healthy firms. However, liquidity variables are not so important as stated in traditional financial analysis. Variables measuring cumulative profitability, such as retained earnings, are generally more significant in the estimated functions.

The main criticisms to the statistical models are the following:

- *They are empirical models* lacking an underlying theory of the crisis of a firm. The accounting data to include in the statistical analysis are chosen on the basis of personal judgement.

- *The coefficients of the functions are not stable. O*ver time these models lose accuracy and need to be re-estimated. Sometimes this loss of accuracy is due to different sensitivities to the economic cycle by the various sectors represented in a given sample. For this reason, it is preferable to have different models for each different sector;

- S*ometimes their sign is not economically meaningful.*

- *Accounting data are not forward-looking*. Because these data are measured at discrete intervals, they do not capture more fast-moving changes that would be reflected in market data.

- *They are based on linear relationships among variables.*

Methods based on Artificial Intelligence techniques

A relatively new approach to the problem of credit risk classification is based on several branches of artificial intelligence methods, such as expert systems and other methods based on automated learning (neural networks, decision trees and genetic algorithms). These methods drop the assumption that variables entering into the distress prediction function are linearly and independently related.

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Table 1: Classification results

Study	model	sample	Overall accuracy - development sample	Overall acuracy - holdout sample	Discriminant variables
Altman (1968, USA)	LDA	33 failed firms 33 sound firms	95.0		working capital / total assets retained earnings / total assets EBIT / Total assets market value of equity / book value of liabilites sales / total assets
Altman, Haldeman, Narayanan (1977, USA)	LDA	53 failed firms 58 sound firms	93.0		EBIT / total assets Stability of earnings EBIT / interest payments retained earnings / total assets current assets / current liabilities equity / total capital
Taffler-Tisshaw (1977, U.K.)	LDA	46 failed firms 46 sound firms	97.0		profit before tax / current liabilities current assets / total liabilities current liabilities / total assets
Altman-Lavalle (1981, Canada)	LDA	27 filed firms 27 sound firms	83.3		sales / total assets total debt / total assets current assets / current liabilities net profit after tax / total debt growth rate of equity / growth rate of asset
Izan (1984, Australia)	LDA	50 failed firms 50 non-failed firms	91.8		EBIT / Total assets EBIT / interest Current assets / Current liabilities Funded debt / Shareholders funds Market value od equity / Total liabilities
Italian CFSD (1997)	LDA	1920 sound firms 1885 unsound firms	91.7	94.4	10 balance sheet ratios: 3 measuring liquidity and working capital 3 measuring profitability and cash flow 4 measuring financial structure and indebtness
French CFSD (1995)	LDA	809 failing firms 1381 non failing firms	over 70.0	over 70.0	7 balance sheet ratios:
German CFSD (1992)	LDA	677 failling firms 677 good firms	89.3		3 balance sheet ratios: 2 measuring profitability and cash flow 1 measuring financial structure and indebtness
Austrian CFSD (1995)	LDA	103 failing firms 103 good firms	78.5		5 balance sheet ratios: 1 measuring liquidity and working capital 1 measuring profitability and cash flow 3 measuring financial structure and indebtness
Gilbert et al. (1990)	logit	76 failing firms 304 sound firms	88.5		
Keasey - McGuinn (1990)	logit	43 failing firms 43 sound firms	81.5		
Platt - Platt (1990)	logit	57 failing firms 57 sound firms	90.0		
Laviola - Trapanese (1997)	logit	1274 failed firms 2022 sound firms	91.0		Interest payments / sales working capital / assets retained earnings / sales EBIT/assets Debt / assets gross operating income / sales

Section F. Measures Based on Market Prices

Introduction

There are three basic types of information that are relevant to estimate the probability of default: financial statements, market prices of a firm‘s debt and equity, and subjective appraisals of firm’s prospects and risk. Statements are reflections of what happened in the past while market prices are forward looking. Prices are formed by a n assessment by all market participants of the company’s future prospects. Current and prospective investors are constantly performing this analysis, and their actions set the price. Thus, prices embody the synthesised views and forecasts of many investors.

The main advantage of market-price-based measures over accounting-data-based measures is that they pick up more subtle and fast-moving changes in borrower conditions, such as those that are reflected in capital market data and values. In addition, accounting-data-based measures are often only tenuously linked to an underlying theoretical model.

In this section, we will first discuss measures based on equity price data. These measures usually incorporate financial statements. Next we will focus on spreads on debts, which are only based on the market prices of a firm’s debts. Then we compare a structural approach to modelling default risk to a reduced-form approach. We close the section by a discussion about the performances of the measures and models.

Measures Based on Equity-Price Data

Equity-price-based approaches like the KMV model (1997) are usually based on risk of ruin, specifically, option pricing models. [61] These models relate the market value of a firm’s assets [62] to the probability of default. They usually start from the observation that, under limited liability, a firm’s equity value is a call option written on the firm’s underlying assets. Merton (1974) modelled equity as a call option on the assets of the firm with the strike price (default point) equal to the debt due at expiration. The claims on equity (debt at maturity) are shown in Figure 1.

[61] See Black and Scholes (1973) or Merton (1974)

[62] Market value of firm assets = market value of equity + market value of debts

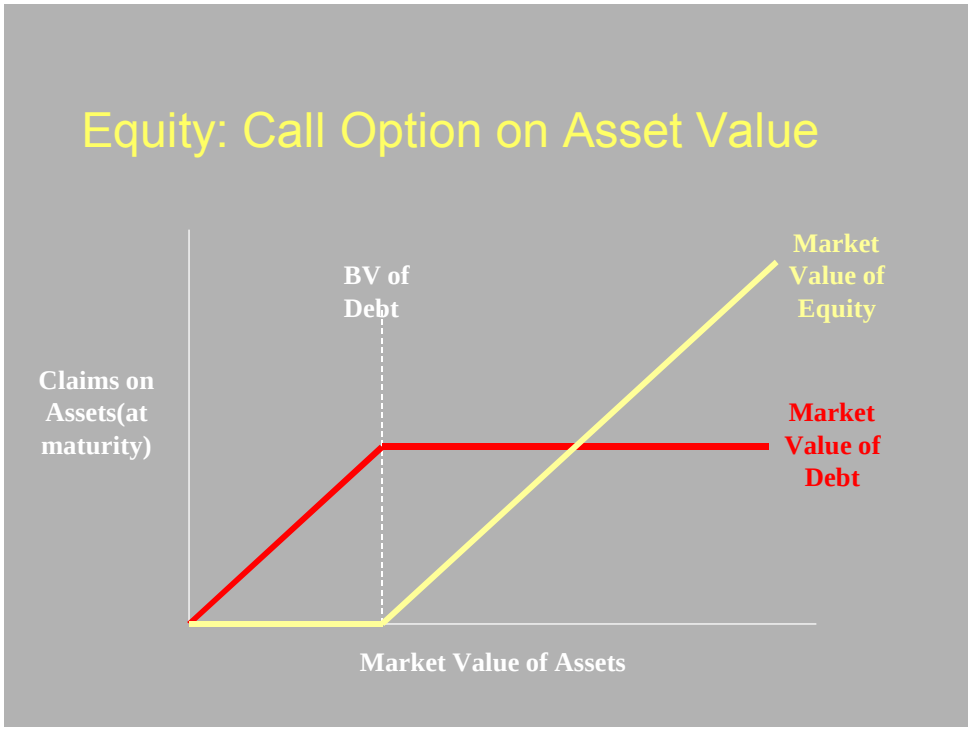


Figure 1

The default risk of a firm usually increases as the value of the assets approaches the book value (BV) of the liabilities. The firm will default when the market value of the assets cannot cover payments on the liabilities. In this approach, there are three main elements that determine the default probability of a firm:

- Asset Value (AVL): The market value of the firm's assets
- Asset Volatility (ASG): The uncertainty or risk of the asset value (a measure of the firm's business risk).

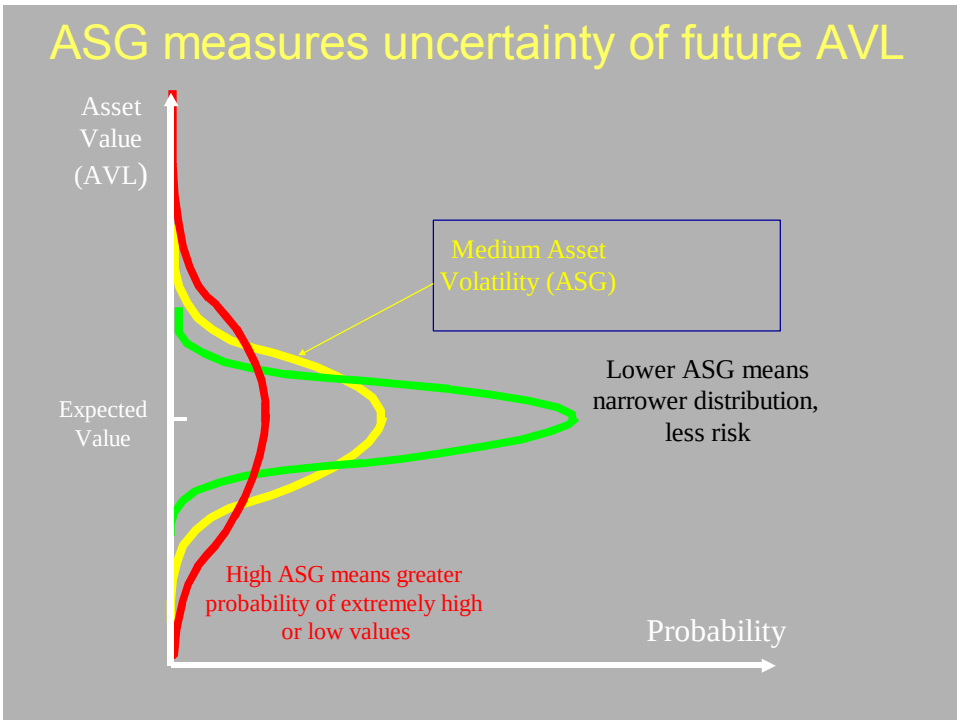


Figure 2

- Capital structure of the firm: the extent and maturity of the firm's contractual liabilities.

The probability of default can be determined by using option pricing theory and is dependent on assumptions on the asset value distribution, more precisely, asset return distributions (Figure 3). Merton's derivative pricing in continuous time based on diffusion processes makes it difficult to handle asset value distributions that are not lognormal.

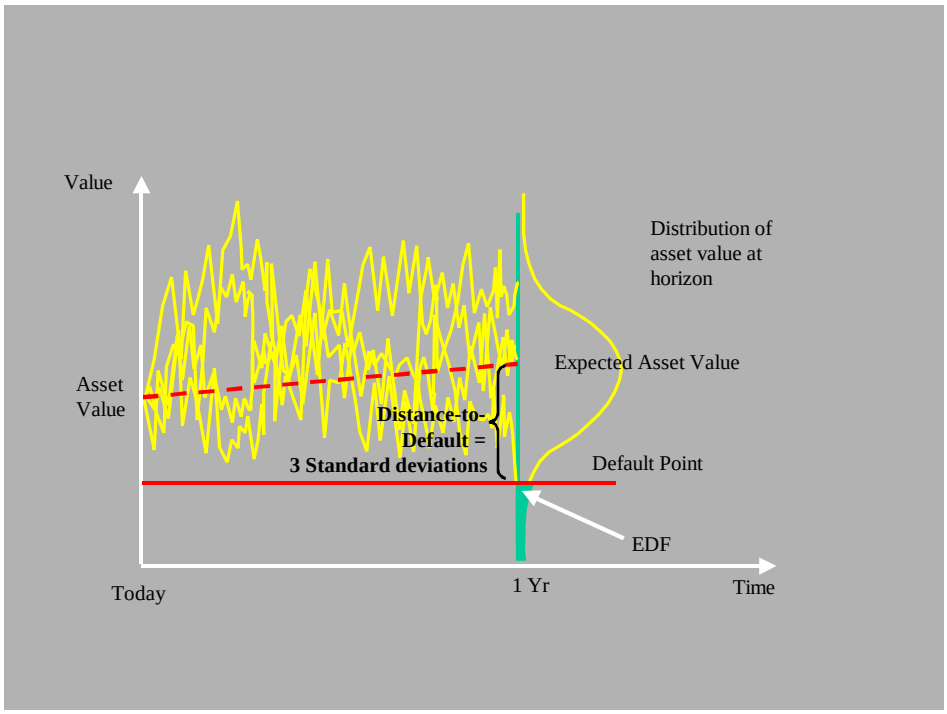


Figure 3

KMV Methodology

The KMV methodology is based on two theoretical relationships, as is the Merton model. The first relationship involves the option pricing model, where the value of equity can be viewed as a call option on the value of a firm's assets. The second is the theoretical link between the observable volatility of a firm's equity value and its unobservable asset-value volatility. KMV notes that the default point, the asset value at which the firm will default, usually lies somewhere between total liabilities and short-term liabilities. The default point differs from industry to industry.

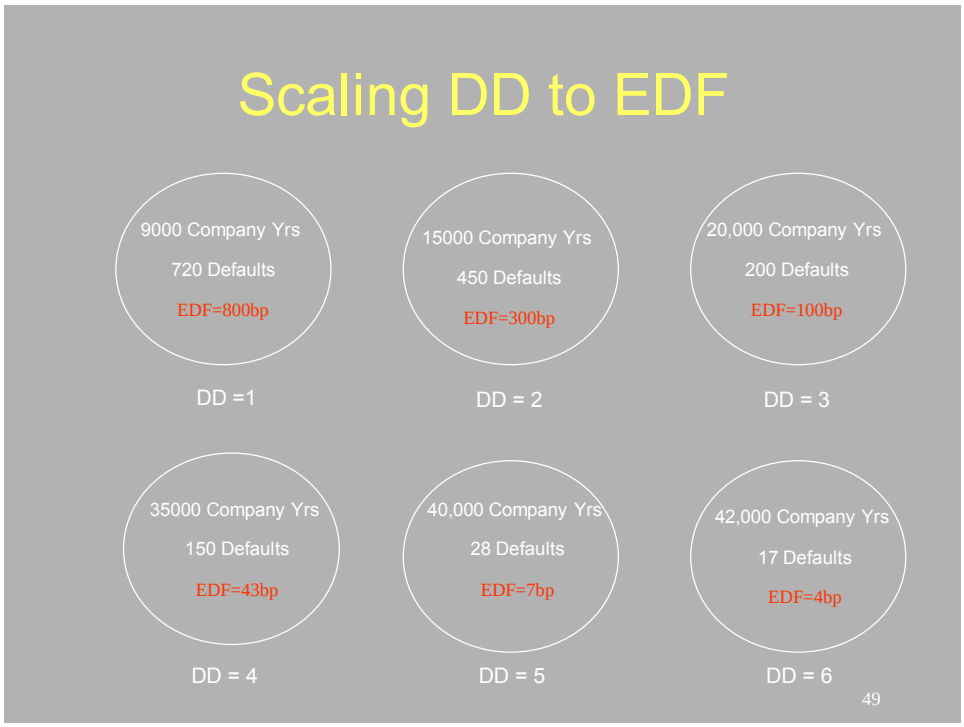
Asset value, (relative) asset volatility, and default point can be combined into a single measure of default risk (denoted as distance-to-default). This compares the market net worth (the market value of firm's assets minus the firm's default point) to the size of one standard deviation move in the asset value.[63] The distance-to-default is calculated as market net worth divided by the product of asset value and asset volatility (Figure 4).

[63] See P. Crosbie (1999).

$$\begin{bmatrix}\text{Distance}\\ \text{to Default}\end{bmatrix} \approx \frac{\begin{bmatrix}\text{Market}\\ \text{Value Assets}\end{bmatrix} - \begin{bmatrix}\text{Default}\\ \text{Point}\end{bmatrix}}{\begin{bmatrix}\text{Asset}\\ \text{Volatility}\end{bmatrix}\begin{bmatrix}\text{Market}\\ \text{ValueAssets}\end{bmatrix}}$$

Figure 4

Finally, KMV maps the distance to default (DD) to the default probability, specifically expected default frequency (EDF), based on empirical studies of default rates. No assumptions about the asset value distributions are used or needed for the mapping from DD to EDF. The main assumption is that DD is an appropriate measure to rank companies.



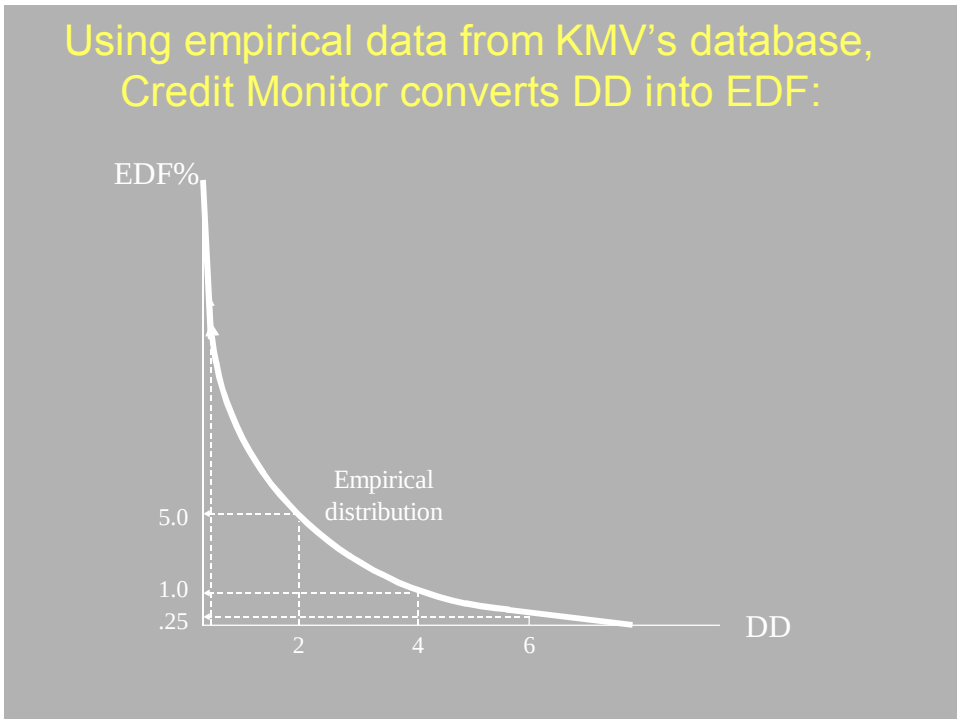


Figure 5

The quantitative process from KMV to measure EDF for listed companies is summarised in Figure 6.

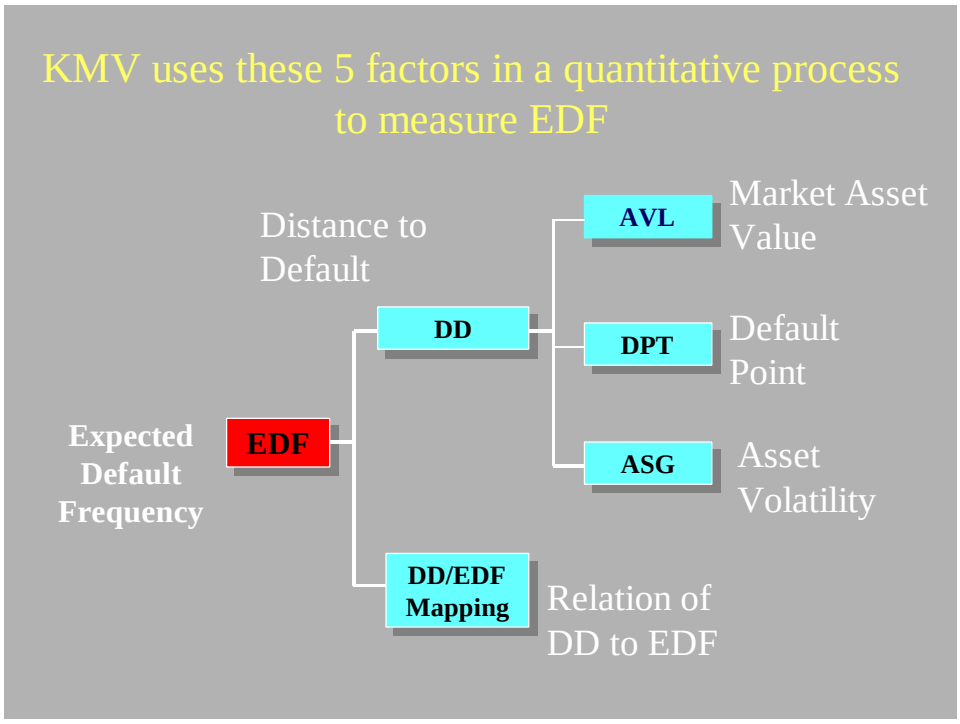


Figure 6

An example is given in figure 7.

Variable	Value in billion $	Remark
Equity Value	22,572 $	
Liabilities	49,056 $	
Asset Value	71,994 $	option pricing model
Asset Volatility	10%	option pricing model
Default Point	36,993 $	
Distance-to-Default	4,8	(72-37)/(72*10%)
EDF (1 Jahr)	21 bp	Empirical Mapping between DD and EDF

Example relates to Chrysler, January 1998
Source: KMV Corporation

Figure 7

Private Firm Model (PFM)

In cases of private companies, for which stock price data are generally not available, KMV uses essentially the same approach. KMV estimates the value and volatility of the private firm directly from observed characteristics such as industry mix, size, and geographic region; and accounting data. The market value of the firm is modelled as maximum of operating value and liquidation value. The operating value is calculated as EBITDA [64] times an asset-value multiplier. This multiplier is determined by using empirical data from listed companies and depends on industry and size. The liquidation value is based on the firm's book liabilities.

[64] Earnings Before Taxes, Interest, Depreciation and Amortization.

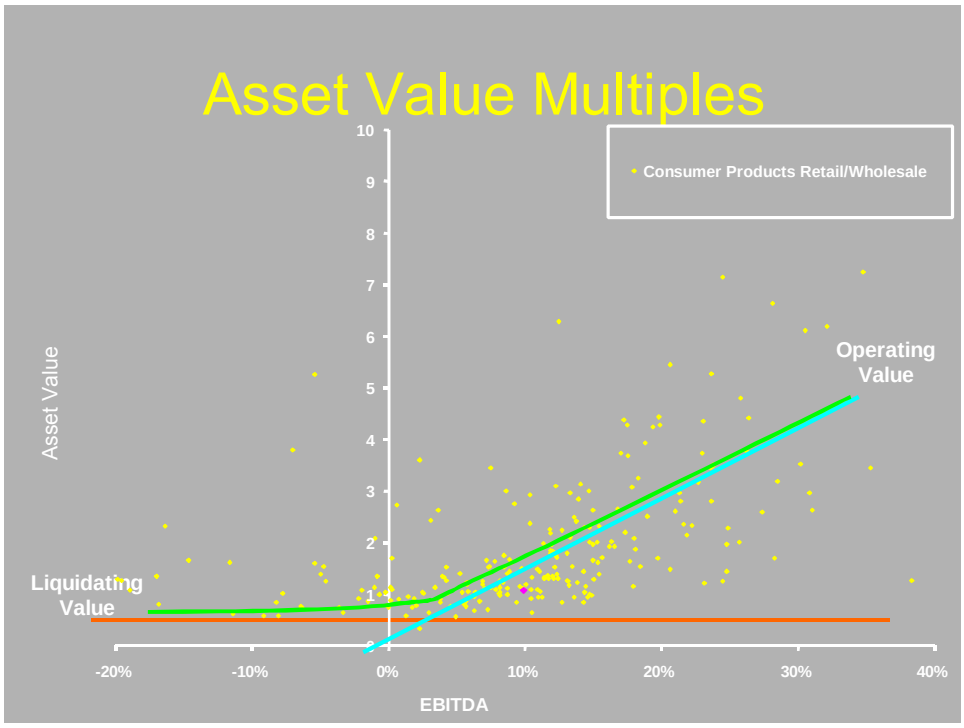


Figure 8

The mapping between DD and EDF is slightly different for the public and private firm models as a result of the information lost in using estimated, rather than actual, market data.

The quantitative process of KMV to measure EDF for non-listed companies is summarised in Figure 9.

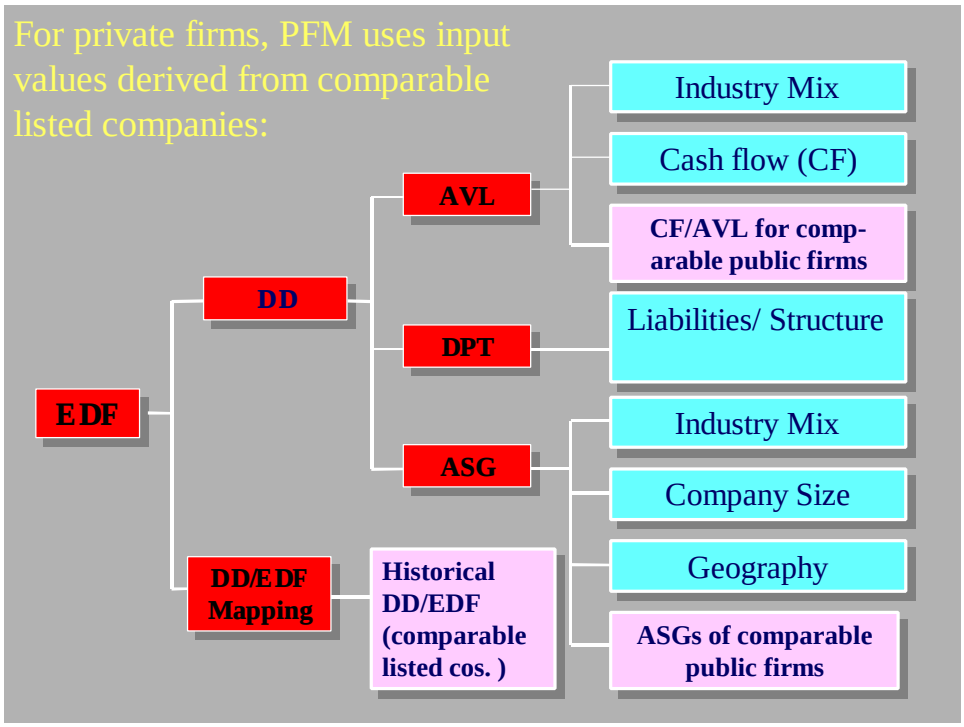


Figure 9

Spreads on Debt

The spread of a risky bond is defined as the difference between the yield of this bond and the yield of a risk-free bond denominated in the same currency and with a similar time-to-maturity. The spread offers some indication of market participants' assessments of the probability that the issuer will default, and the expected rate of recovery in the event of a default. Therefore, the spread incorporates a risk premium for credit risk.

Models based on spreads, specifically credit risk premiums, use the term structure of spreads to determine the implied probability of default. These models are derived from implied forward rates on risk-free and risky bonds. They use these rates to determine the market's expectation of credit risk at different times in the future. If the expected recovery rate in the event of default is known, it is possible to extract the market participants' assessment of the probability of default. This approach is based on the assumptions (among other things) that the expectation theory of interest rates holds, transaction costs are small, and discount bond yield curves can be determined. Many of these assumptions are questionable. Investors usually are not risk neutral. Therefore, the spread does not only cover expected loss, such as default probability and loss-rate given default, but also incorporates a premium for risk. This premium may change over time. An increase of the risk premium can be observed during financial crises in investors' "flight to quality".

Additionally, spreads are not ideal measures of credit risk because they are also affected by issues such as market liquidity. Therefore, spreads do not only have a premium for credit risk, but also one for liquidity risk.

Investigations by KMV for the US market show that the non-credit component of the spread depends on the credit solvency (Figure 10). A higher credit solvency usually means a higher non-credit component. [65]

[65] See also KMV "Valuation, EDFs and Valuing Cash Flows" (1999).

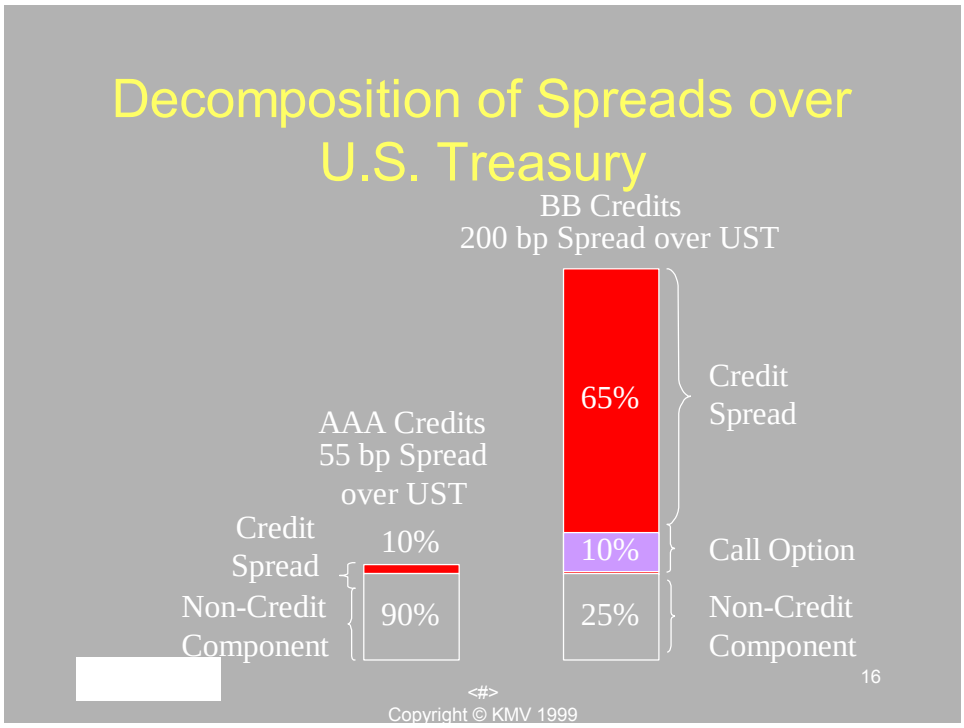


Figure 10

Modelling Default Risk: Structural Approach vs. Reduced Form Approach

Models to determine default probabilities can be divided in two different approaches: a structural approach and a reduced-form approach. [66]

Structural approach

The structural approach is based on the idea of Merton (1974). Default is assumed to occur when the market value of assets has fallen to a point where the firm's total liabilities cannot be covered. The issuer (more accurately, the shareholders of the issuer) receive an option to default on the debt. Different versions of the model reflect varying assumptions about constraints governing when a company can default. Merton (1974) assumes default can occur only at the maturity date of the firm's outstanding debt. Black and Cox (1976) and other authors extended this model to include conditions for default prior to the maturity of debt. The key characteristic of structural models is their reliance on economic arguments on why firms default.

A sample of extensions to the original Black-Scholes-Merton structural models can be found in Geseke (1977), Brennan and Schwartz (1977, 1978 ,1980), Ingersoll (1976, 1977a, 1977b), Leland (1994), Leland and Toft (1996), Longstaff and Schwartz (1995), and Zhou (1997).

[66] See Duffie and Singelton (1998). A survey is given in Bohn (1999).

Reduced-form approach

Duffie and Singleton (1998) defined a second approach called "reduced form". In this approach, the time of default is modelled as an exogenously defined intensity process. Default does not need to depend explicitly on the issuer's capital structure. Since the default process can be endogenously derived, the structural approach is a special case of the reduced-form approach. Divorcing the issuer from the intensity process enables modelling default with much information about why the issuer defaults. However, modelling default without theoretical guidance runs the risk of ignoring both market information and drawing erroneous conclusions.

A sample of reduced-form models can be found in Cathcart and El-Jahel (1998), Duffie and Singleton (1998), Jarrow and Turnball (1995) and Jarrow, Lando and Turnball (1997).

Performance

Determining the performance of a default measure is both a theoretical and an empirical problem. The question is what exactly do we mean by performance or predictive power? In practice, we are not able to classify firms into "will default" and "will not default" categories; we can only hope to estimate probabilities of default. Therefore, testing the performance of a default model means to investigate its ability to discriminate between different levels of default risk. Performance should be measured along several dimensions including power of discrimination, ability to adjust to the credit cycle, and the ability to quickly reflect any deterioration in credit quality. An important issue is the definition of default. Defaults have different definitions across countries, but all definitions indicate economic distress. Therefore, when comparing the performances of different measures, it is important to use the same default definition and the same sample of companies.

One way to determine a model's power of discrimination is using the so-called power curves test. This test measures a model's ability to identify the firms that are going to default for chosen lead times (for example, 12 months). The ability to discriminate is measured using a "hit-miss-ratio". **The power curve test does not require that a model determine default probabilities for companies, but it does require a ranking between companies.** In the testing, percentiles (every 10% mark) are calculated after ranking the EDF's (ratings) gained from the whole population in ascending order. With the distribution of EDF's (ratings) established, a hit-miss ratio is then calculated for each percentile. If the EDF (rating) of each defaulted company is selected at the default date minus lead time, (i.e. if we choose the lead time 12 months), we take the EDF (rating) 12 months before the default date.

The results of this calculation (carried out by KMV) for the Private Firm Model from KMV are shown in Figure 12 for a lead time of 12 months for different countries. Figure 11 sums up the data and testing environment.

European Test Data

	UK	France	Spain	Norway	Sweden
Population (company - years)	40700	75500	19500	8081	7118
Population 1996	9013	16506	5823	3248	5447
Years of data	5	5	3	3	2
Defaults in sample	521	707	266	105	87
Mean probability	1.28%	0.94%	1.36%	1.3%	1.22%

Figure 11

European Power Testing

Percent of defaults excluded when excluding lower percent of the population	UK Privates*	France Privates*	Spain Privates*	Norway Privates^	Sweden Privates*
10%	38%	30%	41%	49%	38%
20%	58%	56%	57%	65%	55%
30%	75%	68%	64%	74%	68%
40%	85%	76%	74%	79%	77%

(^ Bankruptcies only, * Defaults and Bankruptcies)

Figure 12

Interpretation of power curves

We take the UK testing results as an example.

If a bank does not lend to the bottom 10% companies ranked by EDF, then it can avoid 38% of the entire defaulting firms in the sample.

For Germany and the United States, there are, so far, only testing results for Credit monitor (KMV model for listed companies). The results and the methodology for the German testing is described in Liebig and Nyberg (1999).

Germany Test Data

Population (company-years)	Average population	Years of data	Defaults in sample	Mean probability
4137	540	7-8	18	0.19

Figure 13

Germany Power Testing Results

Figure 14 shows the testing results for a lead time of 12 months.

Percent of population excluded	**Percent of defaults excluded**
10%	47%
20%	82%
30%	94%

Figure 14

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Part III. Default and Recovery Studies: Quantifying the Risk

Section A. Default studies

Introduction

Credit ratings distil a vast amount of qualitative and quantitative information on credit quality into a simple ordinal ranking. The simplicity of this ranking allows even a relatively unsophisticated investor the means to compare the **relative** credit risk of a wide variety of debt instruments. It is quite simple to understand that a bond with a "B" rating carries relatively greater risk than one with an "A" rating. However, a more sophisticated investor will often require the means to assess the **absolute** credit risk of a debt instrument. For example, the sophisticated investor may want to know the probability with which the "B" rated bond will default in the next five years and the amount the investor can expect to recover in the event of default.

Default studies

In order to meet the needs of the increasingly sophisticated investor and to gauge the historical consistency of their rating processes, the two major credit rating agencies, Standard & Poor's Corporation and Moody's Investor Service, conduct ongoing research into the default experiences of their rated issuers. S&P's long-term corporate default and rating transition study (Brand and Bahar 1999) analyses the credit history of more than 7,300 obligations rated by S&P's between 1981 and the present. Structured financings, public sector issues, ratings based on public information (the "pi" ratings), and sovereign issuers are excluded. Moody's long-term corporate bond default study (Keenan 1999) analyses the credit history of a total of 15,200 issuers and 2,200 defaulting issues over a 79-year period with special emphasis on the period of 1970 to the present. Moody's default study also excludes structured financings, municipal debt issuers, as well as private placements, and issuers with only short-term debt. Sovereigns issuing long-term debt to the public, however, are included. Non-US issuers comprise over one-third of the current Moody's rated universe.

Both studies employ similar methodologies. The issuer, not the issue, is the unit of study. Subordination is controlled for through the calculation of an implied senior unsecured rating for issuers having only subordinated rated debt (S&P refers to these as "issuer credit ratings"). The rule-of-thumb is that an implied senior rating is one notch higher than the subordinated rating if investment-grade, and two notches higher if speculative-grade. S&P defines default as the first missed payment of principle or interest on debt, rated or unrated. Moody's defines default as any missed or delayed payment, or distressed exchange diminishing the obligation or having the apparent purpose of helping the issuer avoid default. In order to track a rating through time, both agencies group all issuers holding a given implied senior rating together at the start of each year, then track the group from that year to the end of the study. S&P calls these groupings "static pools" while Moody's refers to them as "cohorts". By tracking these groupings through the subsequent years the agencies are able to determine cumulative default rates over multiple year horizons.

These studies find a well-defined correlation between the credit rating and the probability of default: a lower credit rating corresponding to a higher probability of default. Furthermore, these studies find that lower credit ratings are less stable. The S&P's study, for example, finds that higher ratings are longer lived with lower original ratings corresponding to a shorter time to an eventual default. Moody's similarly finds a consistent correlation between default rate volatility and a low credit rating which remains evident over horizons as long as 20 years. Default rates exhibit a cyclical character roughly consistent with the credit cycle (Cantor and Fons 1999), and adverse business conditions coincide with default upswings for all ratings pools (Brand and Bahar 1999). This is not surprising as both agencies state that they seek to "aim through the cycle" when rating an issuer.

Table 1: **Default rates at 1 and 5 year horizons by agency (percent)**

Bond Rating		1 Year Default Rate		5 Year Default Rate	
S&P	***Moody's***	***S&P***	***Moody's***	***S&P***	***Moody's***
AAA	Aaa	0.00	0.00	0.15	0.22
AA+	Aa1	0.00	0.00	0.27	0.25
AA	Aa2	0.00	0.00	0.11	0.50
AA-	Aa3	0.00	0.07	0.40	0.45
A+	A1	0.03	0.00	0.48	0.75
A	A2	0.04	0.00	0.32	0.66
A-	A3	0.07	0.00	0.82	0.45
BBB+	Baa1	0.20	0.04	1.15	1.45
BBB	Baa2	0.19	0.08	1.36	1.29
BBB-	Baa3	0.30	0.31	3.21	2.79
BB+	Ba1	0.62	0.64	5.79	8.45
BB	Ba2	0.78	0.59	6.88	9.66
BB-	Ba3	1.19	2.55	12.23	20.76
B+	B1	2.42	3.56	16.18	25.56
B	B2	7.93	6.85	24.66	28.52
B-	B3	9.84	12.41	29.16	37.49
CCC	Caa1-C	20.39	18.31	41.29	38.30
Investment-Grade		0.08	0.04	0.71	0.82
Speculative-Grade		3.83	3.67	16.08	20.26

Source: Moody's data from Keenan (1999). S&P data from Brand and Bahar (1999).
Note: Moody's data covers period from 1983-1998. S&P data covers period from 1981-1998.

Table 1 lists the historical default frequencies for both agencies (as percentages) for one- and five-year horizons. Given the similarity in the ratings methodologies between S&P's and Moody's, historical default rates provide a means of assessing the comparability of their credit ratings.

Seasoning effect

Altman (1989) raises an important point regarding the effect of the seasoning of a bond issue on measured default rates. Unlike the agency studies, Altman takes the individual bond issue as the unit of study, and so can assess the effect of a bond's age on the probability of default. Typically, the marginal probability of default rises quickly in the first three years, after which it levels off. Therefore, the seasoning effect is most important in the first three to four years of

a bond's life (Caouette et. al. 1998). This fits with the idea that as most issuers have a great deal of cash on hand after a bond issue, they can meet several years of interest payments even if operating cash flows are poor. Therefore, an issuer with poor cash flows will still have a low initial probability of default, and the probability of default only rises over time as the cash infusion from the debt issue becomes depleted. Using the issuer as the unit of study, Moody's (1999) calculates the hazard rate of default to assess the effect of the length of a corporate bond issuer's credit history on the probability of default. These hazard rates of default are quite low in the first two years, rise sharply in the third year and peak in the fourth year after which they taper off. This is in apparent agreement with Altman's study.

Sector comparisons

Although the agency default studies do not categorise default rates by ratings within industries, Cantor and Fons (1999) give some insight into the comparability of ratings across industries for Moody's ratings. Traditionally, Moody's has tailored its ratings to the various needs of the investors in the four main segments of the bond market: corporates, municipals, investor-owned utilities, and structured finance. For example, Moody's ratings of industrial and financial companies have emphasised the relative probability of default. For speculative-grade issuers, Moody's emphasised expected loss rather than the probability of default. For the structured finance sector Moody's also emphasised expected loss while for government and municipals it has emphasised "financial strength". Furthermore, the traditional need to provide a useful dispersion of ratings within a sector compromises the comparability of ratings across sectors. As these markets have become increasingly integrated, however, Moody's has moved to adopt "expected loss" as its unifying concept of credit risk.

Caveats

Default studies of bond ratings provide a wealth of quantitative information on the historical default experience of rated debt. However, this quantitative detail must be used with some caution. Caouette et al (1998) conclude that the agencies remain better at measuring relative rather than absolute credit risk. Despite the needs of investors for more quantitative detail, the simplicity of the ordinal ranking system inherently obscures a great deal of information about the individual issuer. A recent study by KMV Corporation (Kealhofer, Kwok, and Weng 1998) emphasises the fact that the degree of heterogeneity within each credit rating is large. It is not uncommon for bonds with higher credit ratings to have higher default rates than bonds with lower credit ratings (that is, the ratings overlap). For example, there are BBB bonds with AA default rates due perhaps to a lack of timeliness in upgrading and downgrading issuers. This wide range of default rates within a group can cause the mean default rate to vary significantly from the median. The mean may be almost twice as large as the median with as many as 75% of the bond issuers having default rates below the mean. Therefore, it can be misleading to use the historical average default rate of a rating category as the expected default rate for a given rated issuer.

Recovery studies

An investor typically wants more information than simply the probability of default associated with a credit rating. The investor also wants to know the expected loss in the event

of default. The rating agencies have produced studies to address this need. Van de Castle and Keisman (1999) analyse recoveries of 829 debt instruments from over 219 defaults. Recoveries are given in present value terms discounted from the date of emergence or liquidation to the last date interest was paid. Increasing the amount debt subordinated to a given issue or increasing the amount of collateral tends to increase the recovery rate for the issue in the event of default.

Table 2: **Recovery estimates for S&P's rated debt (percent of par value)**

Debt Class	Recovery	Std Deviation
Bank Loans	84.5	24.9
Senior secured	65.7	28.4
Senior unsecured	49.3	35.8
Senior subordinated	36.8	31.0
Subordinated	26.1	30.3
Junior subordinated	13.6	24.4

Source: Van de Castle and Keisman (1999).
Note: Data covers period from 1987-1998.

As part of Moody's default rate study, Keenan (1999) uses the trading price of defaulted securities to calculate recovery rates (as a percent of par) on defaulted securities. This study also shows that recoveries increase with the seniority of the claim.

Table 3: Recovery Estimates for Moody's Rated Debt (Percent of Par Value)

Debt Class	Recovery	Std Deviation
Bank Loans	70.26	21.33
Senior secured	55.15	24.31
Senior unsecured	51.31	26.30
Senior subordinated	39.05	24.39
Subordinated	31.66	20.58
Junior subordinated	20.39	15.36

Source: Keenan (1999).
Note: Data covers period from 1977-1998 with the exception of bank loans which cover the period from 1989-1996.

The recovery (or loss) studies consistently show that seniority and collateral decrease the expected loss on defaulted debt. This supports the convention of rating subordinated debt a notch or two below senior debt. Furthermore, once seniority is accounted for, the distinction between investment grade and non-investment grade ratings has no effect on recoveries (Caouette et al 1998). A variety of studies lend further credence to the rule-of-thumb that defaulted securities recover about 40 cents on the dollar.

Default and recovery studies on syndicated bank loans

Traditionally there has been a dearth of information on the default and recovery experience of rated bank loans compared to that available on corporate bonds. Recently, however, the growth of the syndicated bank loan market has allowed for a pair of studies on the default and recovery experience of rated syndicated bank loans.

Altman and Suggitt (1997) conducted the first default study of syndicated bank loans. The study uses a data set on commercial loans of at least USD 100 million in size for which there was either an original rating assigned by one or more of the major ratings agencies or a bond rating from which an implied senior rating could be assigned. The author's note that Moody's does not use such an assignment in its treatment of the loans of issuers with bonds outstanding. By using assigned ratings, however, the authors were able to substantially increase the sample size. The sample covers the time period from 1991 through 1996, involves 4,069 ratings on over 2,184 borrowers for a total of USD 2.4 trillion in aggregate facilities. Assigned ratings are more predominant before 1995 when Moody's began rating large corporate loans. The study employs Altman's issue-based mortality methodology (Altman 1988) that differs from the issuer-based methodology of the agency studies.

Table 4: Syndicated Bank Loan and Corporate Bond Default Rates (Percent)

Rating	1 Year Default Rate		5 Year Default Rate	
	Bank	***Bond***	***Bank***	***Bond***
Aaa	0.00	0.00	0.00	0.00
Aa	0.00	0.00	0.00	0.00
A	0.00	0.00	0.12	0.05
Baa	0.04	0.00	0.04	0.54
Ba	0.17	0.00	7.10	4.42
B	2.30	0.81	9.97	9.24
Caa	15.24	2.65	31.77	29.51

Source: Altman and Suggitt (1997).
Note: Data covers period from 1991-1996.

The default rates of the syndicated bank loans are quite similar to those of the bonds, particularly at the five-year horizon. This may, however, be influenced by the use of assigned ratings.

A recent study by Fitch Research (Grossman, Brennan, and Vento 1997) on the recovery experience of defaulted syndicated bank loans complements the Altman default study. Fitch examines 60 distressed syndicated secured bank loans worth a total of USD 25 billion over a six-year period ending in June 1997. Unlike the agency studies, Fitch uses the market price of the defaulted loan at the end of the restructuring or bankruptcy period as a proxy for the final realisation of value without discounting the value back to the point of initial distress. Distressed loans include not only those in default, but also those making interest payments but that the market values at less than 80 cents on the dollar.

The study finds that recoveries on distressed bank loans are high (82%) compared to recoveries on senior subordinated debt (42%) and subordinated debt (39%). Furthermore, the study finds that the amount of the recovery is related to the industry of the issuer. As

expected, low levels of hard assets, high levels of pledged assets, or obsolescence-risk reduce recoveries while a solid business franchise and high quality plant and property increase recoveries. The study also finds that the average distressed bank loan remains in distress for 19 months during which time its returns exhibit a moderate correlation with the stock market.

Conclusion

Credit ratings simplify a vast amount of information pertaining to credit quality into a simple ordinal ranking. The default and recovery studies conducted by the agencies and other researchers relate these credit ratings to quantitative credit risk information such as default rates and expected loss rates on defaulted debt. While this quantitative detail is useful for gauging the absolute credit risk associated with a debt instrument, the credit rating remains a more accurate assessment of the relative rather than the absolute credit risk of an issuer.

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Section B. Stability of Transition Matrices

Introduction

Bond ratings have been assigned to publicly traded indebtedness ever since the establishment of the ratings industry by Moody's Investor Service in 1909. [67] The credit opinion assigned by a rating company assesses an issuer's ability to meet its debt obligations in a timely fashion. These ratings are typically first assigned at the time of initial issuance. The agencies also perform both periodic and market-based reviews of those ratings over time. Ratings changes reflect an agency's assessment that a company's credit quality has improved (upgrade) or deteriorated (downgrade). The rating agencies have been successful in assessing the relative levels of risk, but the degree of those changes, or ratings migration, and the absolute level of risk that individual ratings represent have varied over time and across ratings categories.

The issue of credit quality migration is very important for fixed-income investors, institutions, regulators, and managers of credit risk. Investors are concerned with migration of ratings because it influences the price of a bond. Institutions are concerned with ratings changes because of internal policies limiting the percentage of below-investment-grade loans that banks desire to hold. Regulators are concerned with ratings since in some cases they determine investment eligibility of assets and valuation for capital determination. Credit ratings migration also plays a major role in credit risk management. [68] Finally, risk management tools, such as Credit Metrics, specifically utilise credit migration measures as one of its primary inputs. [69]

The rating agencies track the performance and stability of their ratings in what are commonly referred to as "transition" matrices. These matrices assess the issuers' "credit paths", or ratings history. They are constructed mainly for risk managers and investors to provide insight into expected future paths. Both Moody's and S&P release annual or periodic studies on the performance and stability of their ratings and paths. [70] The primary purpose of this section is to provide a detailed examination of these transition matrices and their stability.

Transition matrices

Transition matrices measure the probability of a credit rating being upgraded or downgraded within a specific time period. S&P and Moody's both look at the rating migration of credit

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[67] In 1922, the Poor's Corporation (S&P's predecessor) was established and became an active player. Both the major raters currently rate nearly every taxable security in the US market that has been registered with the Security and Exchange Commission.

[68] See Lucas (1995) for a discussion on how OTC market participants use downgrade provisions to reduce counterparty risk.

[69] See Gupton, Finger and Bhatia (1997).

[70] For example, see Moody's Investor Service, Global Credit Research, "Historical Default Rates of Corporate Bond Issuers", January 1999; Standard & Poor's, Special Report, "Ratings Report 1998: Corporate Defaults Rise Sharply in 1999", (March 1999).

quality in all ratings categories for various time horizons, including one, five, and 10 years, and in some cases longer. The transition matrices issued by the major ratings companies include all industrial and transportation companies, utilities, financial institutions and sovereigns that have issued long-term debt to the public.

Transition matrices are calculated by comparing beginning-of-period ratings to end-of-period ratings. Transition matrices focus on two distinct points in time, typically the first and last days of a year, and ignore any intervening changes.

Table 1 provides a generic example of a transition matrix. The vertical axis shows ratings at the beginning of a year, while the horizontal axis shows ratings at the end. From these two points, the matrix measures the probability that an issuer will experience a net change from the row rating to the column status at the end of a specified time period. The values along the diagonals, in bold, represent the probability that an issuer will have the same rating at the beginning and end of the period. The off-diagonal elements represent the percentages of upgrades or downgrades. Movement to the right of each diagonal element represents downgrades, while movements to the left represent upgrades. For example, of all the issuers rated Aaa at the beginning of the year, 85.44% were rated Aaa at the end of the year; 9.92% were rated Aa, and 0.98% were rated A.

Table 1: Moody's One-Year Transition Matrices

Corporate Average One-Year Rating Transition Matrix, 1980-1998

	Rating to (%)								
Initial Rating	Aaa	Aa	A	Baa	Ba	B	Caa-C	Default	WR
Aaa	**85.44**	9.92	0.98	0.00	0.03	0.00	0.00	0.00	3.63
Aa	1.04	**85.52**	9.21	0.33	0.14	0.14	0.00	0.03	3.59
A	0.06	2.76	**86.57**	5.68	0.71	0.17	0.01	0.01	4.03
Baa	0.05	0.32	6.68	**80.55**	5.72	0.95	0.08	0.15	5.49
Ba	0.03	0.07	0.51	5.20	**76.51**	7.40	0.49	1.34	8.46
B	0.01	0.04	0.16	0.60	6.07	**76.12**	2.54	6.50	7.96
Caa-C	0.00	0.00	0.66	1.05	3.05	6.11	**62.97**	25.16	0.00

WR-Withdrawn Rating

Source: Moody's Investor's Service, January 1999, "Historical Default Rates of Corporate Bond Issuers, 1920-1998."

Ratings universe

The Moody's ratings universe includes over 15,200 issuers that sold debt between 1919 and 1999. As of January 1999, over 4,600 issuers held current Moody's ratings.[71] S&P issued

[71] Moody's Special Comment "Historical Default Rates of Corporate Bond Issuers, 1920-1998", January 1999.

7,328 long-term ratings from 1981 through the end of 1998. As of January 1999, around 4,000 issuers held S&P ratings. [72] The construction of the rating agencies' transition matrices, and actuarial mortality approach to transitions employed by Altman and Kao, are outlined briefly below.[73]

Transition tracking methods

S&P transition matrices use the implied senior unsecured rating of each issuer, regardless of the size of a particular issue or the number of shares outstanding from that particular issue. S&P produce transition matrices by what they refer to as "static pools". These pools are formed on the first day of each year and are followed from that point forward. Membership in a pool remains static, except for withdrawn ratings, called, or defaulted issues.[74] The ratings are compared on the first and last day of each year to construct the transition matrix for that pool. Every year a new static pool is formed with new issuers from that year and the active issuers of the previous pool.

Moody's, similar to S&P, relies upon an implied senior unsecured rating of the issuer, rather than the ratings of individual debt instruments. They take a similar approach to constructing the transition matrices, but they refer to the pools as "dynamic cohorts". The cohorts are dynamic in that they change when ratings are withdrawn, defaulted or called. Like S&P they use the first and last days of the year in constructing cohorts. For each period, the transitions express the ratio of issuers who changed to issuers who could have changed. [75]

Several academic studies have taken a slightly different approach to measuring and reporting ratings transitions. Altman (1989) and Altman and Kao (1992) were the first to take an approach to constructing transition matrices assessing the changes from an initial bond rating, usually at time of issuance. They argue that this distinction is important because of an ageing or seasoning effect that is observable in the early years after issuance and that such an effect generally disappears within four to five years. This result is intuitively appealing because as Altman (1992) notes, that as time passes strong companies are able to call or repurchase their debt and refinance it with lower coupon issues. Thus, the remaining pools of issuers naturally display higher default/transition rates. Asquith et al (1989), Altman (1993), Jonsoson and Fridson (1996) and Carty (1997) have documented the ageing effect elsewhere in the literature. Several researchers focusing on high-yield bonds have found also found similar bond ageing effects. For example, Moeller and Molina (1999) find that high-yield bonds face an increasing default risk in time.

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[72] Standard and Poor's, "Ratings Performance 1999," p.5 and 13.

[73] Neither Fitch nor Duff and Phelps release transition matrices. If one tried to construct a transition matrix for Fitch, however, it would be biased since they only reveal ratings of borrowers electing to make this information public.

[74] Most of the withdrawn ratings occur when an entity's only outstanding issue is paid off or when the program rated is terminated and the debt eliminated. Some are also eliminated due to lack of information or mergers and acquisitions.

[75] This is identical to a "hazard" rate.

Besides cohort or pool construction, there are two other important differences in how Altman and Kao (1992) construct transition matrices. First, Altman and Kao transitions are based on the ratings of specific issues, rather than the implied senior unsecured rating of issuers. Second, unlike the rating companies, Altman and Kao (1992) do not include the ratings category "withdrawn" when reporting their transition matrices. A withdrawn rating can mean one of two things: a bond has been called or redeemed in an acquisition, or alternatively, there is insufficient information to rate the bond. [76] Altman and Kao's mortality-based approach assumes that these issuers were not at risk of having their ratings changed and are dropped from the analysis. [77]

The primary difference that arises when comparing the two ways to construct transition matrices is that the pools or cohorts tracked by the major rating companies contain portfolios of both seasoned and new-issue bonds. The raters believe that this approach is more appropriate for two reasons. First, they argue that if an investor feels that the business conditions of the current year are similar to those of a previous year, they may consult directly that year's cohort to assess what transition patterns to expect. (Essentially, this is an argument that macro-phenomena are more important than the vintage effects that the mortality-based approach picks up.) Second, they argue that because few issuers default early in their ratings history, their approach avoids giving lower default rates in periods of high or increasing ratings activity.

Issues of construction aside, comparing transition matrices is problematic because of the different time periods that the raters' data cover. Moody's data cover 1920-1998; published S&P data cover 1981-1998; and the Altman/Kao studies use data from the 1970's to 1989. Moreover, as described below, changes in the number and types of debt issues, the industries rated, and initial credit quality over those time periods exacerbate the difficulties in making direct comparisons of transition matrices.

The remainder of this section is outlined as follows. First, we will review the literature on secular trends associated with credit ratings that may affect the observed transition matrices. [78] For example, we examine general trends in the number and types of issuer ratings and their possible impact on transitions. The next section examines the role of cyclical considerations taken by agencies when assigning these ratings and the implications of these factors on observed transition matrices. Finally, we will review the literature on ratings changes, or drift, for a comparison of the changes made by Moody's and S&P over various time horizons. The final section also explores the impact of the different methodologies on observed drift, and includes a discussion of the limitations inherent in comparing agencies' published transition matrices.

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[76] Both Moody's and S&P say ratings are never withdrawn due to poor credit quality.

[77] The rating agencies offer users of their databases the option of incl uding or excluding withdrawn ratings. See Carty (1997) for a fuller discussion of the treatment of withdrawn ratings.

[78] The second-tier agencies, such as Fitch, and Duff and Phelps, have produced very little literature on the performances of their ratings.

Secular Trends: Evidence from the Ratings Companies

Changes in credit quality are of obvious interest to investors and regulators alike. Before examining changes in credit quality as measured by ratings, however, it is important to assess what these changes are measuring and how this has changed over time. One of the most fundamental changes in capital markets over the past few decades is the large increase in the number and types of firms acquiring ratings. This section examines some of the secular trends that may impact ratings performance and the stability of transition matrices. [79]

Number of rated issues

Table 2 shows that the number of issuers rated by S&P has almost tripled from just over 1,300 in 1981, to more than 4,000 in 1998. This is reflective of the increased use of leverage by corporations and the increased attractiveness of fixed income securities to investors. Table 2 also provides the breakdown between investment grade and speculative grade issued ratings for that time period. First, there is an obvious cyclical component to issuer ratings, which will be analysed in the next section. More generally, speculative grade issuers have become a more important component of the rated universe.

Changes in firms obtaining initial ratings

Table 3 separates out from the S&P data firms that are obtaining an initial rating, rather than examining the overall distribution of all firms receiving ratings. The table shows that S&P assigned initial ratings to almost ten times as many firms in 1998 (720) as it did in 1981 (75). It also shows that in recent years more financially weaker companies, both in terms of number and percent of rated issuers, seek funding in the bond market. [80]

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[79] Moody's and S&P have very similar ratings universes. Thus, the figures described below from either of the universes are closely interchangeable.

[80] Moody's has experienced similar trends. In 1999 over 4,600 issuers held Moody's ratings, while comparable figures are about 2,500 in 1990, 1500 in 1988, 1,000 in 1970. (Moody's (1999) p.8).

Table 2: **S&P: Number of Issuers by Year**

Year	Number of Issuers	Investment Grade (percent)	Speculative Grade (percent)
1981	1,354	77.30%	22.70%
1982	1,408	76.60	23.40
1983	1,429	76.50	23.50
1984	1,523	75.60	24.60
1985	1,616	73.60	26.40
1986	1,867	71.00	29.00
1987	2,027	65.70	34.30
1988	2,110	64.10	35.90
1989	2,176	65.60	34.40
1990	2,186	67.50	32.50
1991	2,127	72.00	28.00
1992	2,217	76.40	23.60
1993	2,400	76.30	23.70
1994	2,726	73.20	26.80
1995	3,092	77.30	22.70
1996	3,264	72.50	27.50
1997	3,516	71.60	28.40
1998	4,014	67.70	32.30

Source: Standard and Poor's, “Ratings Performance 1998”, (1999)

Table 3: **S&P Initial Ratings 1981-1998**

Year	Total New Issues Rated	Investment Grade (percent)	Speculative Grade (percent)
1981	75	54.67%	45.33%
1982	107	70.10	29.90
1983	178	62.92	37.08
1984	150	50.00	50.00
1985	323	60.68	39.32
1986	329	37.69	62.31
1987	315	41.27	58.73
1988	258	57.25	42.25
1989	217	53.92	46.08
1990	149	77.18	22.82
1991	248	83.87	16.13
1992	319	58.62	41.38
1993	530	49.81	50.19
1994	516	63.76	36.24
1995	351	49.29	50.71
1996	497	50.30	49.70
1997	735	39.32	60.68
1998	720	33.17	66.83

Source: Standard and Poor’s, “Ratings Performance: 1998” p.4 (March 1999).

Industrial composition

The industrial composition of firms obtaining ratings has changed over time. For example, in the early part of the century, railroads were the major type of entity seeking ratings. In 1920, more than half of the issuers Moody's had rated were railroad companies, followed by utilities, industrial, and financial companies. [81] In 1999, industrial companies make up almost 39% of the total number of rated firms; non-bank financial companies hold the second spot at 17%; banks are third, making up 14% of rated firms. Other changes include the types of ratings included in calculating transitions. For example, beginning in 1995, S&P widened its selection criteria holders of other long-term credit ratings, including corporate ratings and counterparty ratings. [82]

Geographic trends

The type of firms included in the rated universe has also changed geographically. In 1998, 62% of Moody's rated issuers were from the United States, followed by the United Kingdom (5.6% of the rated universe), Japan, (5.5%) and Canada (3.8%). [83] In recent years, however, members of the European Community (including the UK) and emerging market have bee the fastest growing components of the rated universes. Over time, that has dramatically changed the composition of the ratings universe. According to Moody's the growth in the number of EC-domiciled issuers since 1980 has averaged around 20% per year, while the average for all other countries is under 6%. Emerging market rated issuers, although they still make up a relatively small percentage of the rated universe, grew 45% annually from 1993 to 1998. Most of those issuers receive speculative grades, so they have had a significant impact on the below-investment grade universe.

Trends in long-term letter ratings changes/ratings stability over time

Several academic studies have examined the number and percentages of credit upgrades and downgrades over time. Carty and Fons (1994) employ Moody's data base of over 4,700 long-term issues and 2,400 short-term issues calculate the annual percentage of issuers upgraded or downgraded one or more letter ratings over various decades. The numerator in their analysis is the number of issuers upgraded or downgraded; the denominator is the number of ratings at risk of change over that time period. They find that trends in overall corporate credit quality, as measured by the percentage of upgrades and downgrades, have changed over time. For example, during the 1950-1980 time period they find that on average 4.77 issues changed ratings, while drift averaged a mere - .07%. During the 1980-1993 time period, however, the average number of issuers experiencing ratings changes rose to 12.43%, while drift turned more negative at -4.97%.

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[81] See Moody's Special Report, "Historical Default Rate of Corporate Bond Issuers", (January 1999), p.8.

[82] See S&P Credit Week, "Corporate Default Rise Sharply", March 10, 1999, p.10.

[83] See Moody's Special Report, "Historical Default Rate of Corporate Bond Issuers", (January 1999), p.8.

Lucas and Lonski (1992) examine the credit ratings of more than 4,000 rated US and international debt issues from 1970 to 1990. They find that corporate credit worthiness became more volatile over the time period and that the increased volatility was accompanied by a downward trend in ratings. For example, they find that 1% of AAA-rated companies was downgraded to speculative grade within five years, and two 2% in ten years. For Baa-rated companies the comparable figures were 9% within five years and 15% within ten years. Cantor and Packer (1994) find that the experience since the 1970s indicated that the correspondence to default probabilities is subject to substantial change over time. Finally, a recently published paper by Nickell, Perraudin and Varotto (2000) reports differences in transition matrices when subsetting out some countries, such as Japan and industries, such as banking.

Altman and Kao (1992) analyse the stability of newly issued S&P ratings for two sub-periods—1970 to 1979 and 1980 to 1988. Table 4 reproduces their results. The table shows that for every rating and time horizon (1-5 years) newly rated issues from the earlier period exhibit more stability. As discussed earlier, however, the composition and size of the ratings universe changed over this time period.

Table 4: Stability of Newly Issued Ratings

Rating	Years After Issuance	1970-79 Proportion Unchanged	1980-89 Proportion Unchanged
AAA	1	97.4%	91.6%
	2	94.7	79.2
	3	92.1	66.9
	4	87.7	57.9
	5	80.0	49.3
AA	1	95.3%	91.1%
	2	87.5	83.1
	3	80.3	75.8
	4	73.1	71.8
	5	67.6	68.6
A	1	96.3%	88.6
	2	92.3	76.9
	3	87.9	68.0
	4	83.1	62.2
	5	77.7	58.9
BBB	1	96.3%	87.4
	2	93.6	76.8
	3	87.9	63.6
	4	80.9	56.8
	5	74.3	52.3
BB	1	98.6%	81.0%
	2	88.2	67.1
	3	70.1	58.3
	4	62.7	50.0
	5	46.9	30.8
B	1	97.5%	93.3%
	2	97.5	81.6
	3	82.5	72.7
	4	75.8	57.8
	5	68.7	50.5
CCC	1	100%	91.6%
	2	81.3	80.4
	3	46.7	71.0
	4	40.0	50.0
	5	35.7	21.4
		N=2603	N=-4592

Changes in ratings severity

There is some new literature on whether the severity of the ratings process has changed over time. Specifically, Blume, Lim and Mackinlay (1998) address whether the recent trends of downgrades versus upgrades in corporate bond ratings is the result of declining credit quality of US corporate debt or alternatively the ratings standards have evolved over time. Using

ratings data from 1978-1995, they argue that rating agencies have become more stringent, implying in part the downward trend in ratings is a result of changing standards. [84]

Conclusion

There has been a dramatic increase in the number, types, geography, credit quality and industrial classification of firms obtaining ratings from the major rating agencies. The ratings universe is much different today than it was even a decade ago, with more sovereigns, emerging-market, and speculative grade issuers, in addition to a changing industrial composition. The large increase in the number of issuers and the well documented "ageing" or seasoning effect, suggest that the ratings agencies transition matrices need to be interpreted with caution since having a large percentage of unseasoned credits or differing percentages across pools or cohorts may disguise other credit quality trends. The overall downward trend in initial ratings over time also impacts the observed transition probabilities, since these issues have historically been more volatile. Finally, because ratings capture overall credit quality that includes default probability, loss severity, financial strength and transition risk - issuers with identical ratings may in fact exhibit vastly different transition paths. [85] Given the variety of changes in the rated universe over time, it is possible that types of issuers with identical ratings may have vastly different transition matrices.

An issue that the literature examines is whether, given the enormous amount of activity and increased reliance on credit ratings, the ratings companies have altered the severity of their assessments over time. Blume, Lim and McKinlay (1999) find support this hypothesis. If this is the case, changes in ratings severity over time will also influence the observed transition matrices. Finally, a full exploration of the properties of transition matrices should include more than an assessment of the influence of secular trends. Other factors that should be reviewed carefully include the discrete nature of transition matrices, the possible lack of ratings timeliness, and the possible widespread differences in issuer default probabilities of identically rated issues. [86]

Cyclical Considerations

An important issue in analysing ratings and their transitions is how to best incorporate macroeconomic cycles. Cycles are forces exogenous to the issuer such as changes in interest rates and income, or fluctuations in consumer or business confidence. Companies cannot control these events, and some companies or countries are in fact more susceptible than others to their influences. The timing, length and severity of cycles are at best difficult to predict, which complicates further their incorporation into credit ratings. Finally, incorporating cyclical conditions into issuer ratings is made even more daunting for the rating companies

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[84] Moody's and S&P ratings have been fairly comparable over the years.

[85] According to Moody's sectors such as banks, sovereigns, investor owned utilities, local governments and securities firms are subject to higher "transition" risk. See Moody's Ratings Methodology, "The Evolving Meaning of Moody's Bond Ratings", p.3 (August 1999).

[86] Kealhofer, Kwok and Weng (1998) contain a discussion of some of these issues.

because as they are active in more than 100 countries. Ideally, they would need to produce accurate forecasts for each country to fully incorporate these conditions in to their ratings.

Given the complexity and efforts involved in macroeconomic forecasting, the ratings agencies give only modest weight to cyclical economic conditions. They are, in general, reluctant to make ratings changes based simply on cyclical considerations. [87] Still, given the current state of the economy, raters are supposed to separate out equilibrium and cyclical components of companies when assigning a rating. This is made even more complex when we look over long-term horizons whereby structural factors, such as technology advances and changes in tastes and preferences, also occur. All these factors make it even harder to "rate over the cycle" since they also have occurred at irregular intervals.

As a consequence of rating across the cycle, the ratings agencies expect that the actual measured default rates by rating category to exhibit pronounced cyclical patterns, rising in recession and falling in recoveries. Both Moody's and S&P upgrades and downgrades are fairly consistent with this pattern. Table 2 shows that the cyclical patterns in the distribution of ratings number of speculative grade issuers rises during recessions. Although the ratings agencies rate across the cycle, this may have different implications for investment-grade and below-investment-grade borrowers, who are more likely to be susceptible to cyclical conditions.

Several academic pieces have examined the impact of economic conditions on high-yield borrowers. Helwege and Kleiman (1997) examine the impact of economic shifts on the default rates of high-yield corporate bonds. They find that the riskiness of bonds outstanding, the time that has passed since a bond was issued, as well as economic conditions influence the transition to default. We can surmise that the results can be generalised to for other non-terminating transitions. McDonald and Van de Gucht (1999) examine high-yield bonds and find these issuers are more likely to default when economic conditions have worsened and no improvement is anticipated.

A recently published paper by Nickell, Perraudin and Varotto (2000) investigates the impact of the macroeconomy on ratings transitions. The authors break up the state of the economy into three distinct states: peak, normal and trough depending on whether real GDP was in the upper-, middle- or lower-third of growth rates of the sample period (1970-1997). They find several interesting results. First, they find that lower-rated bonds have less ratings volatility, and are less prone to downgrades. Second, they find that default probabilities are especially sensitive to the business cycle. Finally, they find that some transition probabilities are counterintuitive, such as the transition probability from Caa to Ca being highest in normal times.

Examining two static pools at different points in the business cycle can give some idea of how transitions to other states besides default are influenced by cyclical conditions. Table 5 shows S&P static pools from the most recent trough and peak (to that point in the business cycle) years, 1991 and 1998. As shown in the table, the percentage of downgrades is higher in the trough period than at the peak. For example, 9.76% of AAA ratings were downgraded to AA compared to 6.06% in 1998. Similar results hold for the other initial ratings. Another

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[87] Moody's Rating Methodology, "The Evolving Meaning of Moody's Bond Ratings", (August 1999), p.7.

intuitively appealing result in the table is that the percentage of withdrawn ratings are higher during the boom for higher rated issuers, most likely due to calls and refinancing. These comparisons must be tempered by the fact that the two pools may differ greatly by the factors discussed in the first section, including "ageing", industrial composition and geography.

Conclusion

The transition matrices provided by the ratings companies attempt to rate across the cycle. Cyclical economic conditions, however, affect the ratings and their stability. In fact, the swings in ratings are more pronounced during recessions and boom periods with more issuers downgraded during recessions and more upgraded during expansionary periods. As one would surmise, speculative-grade issuers are more susceptible to economic cycles than investment-grade issuers. Nickell, Perraudin and Varotto (2000) find that low-rated bonds have less ratings volatility during business peaks and that default probabilities are especially sensitive to the business cycle. The greater sensitivity of the migration to default to the business cycle is not surprising given that the ratings companies initiate other ratings changes, while defaults are beyond their control.

The academic literature has focused on the impact of economic conditions on high-yield bonds to the final migration-default. Two separate studies, Helwege and Kleiman (1997) and McDonald and Van de Gucht (1999) find that economic conditions are an important determinant of the transition to default for high-yield issues. A quick comparison of S&P pools over both boom and bust years shows that not only speculative grade issues exhibit higher propensity to being downgraded, but investment grade issuers do as well.

Table 5: One-Year Transition Matrices

Panel A.

S&P 1991 Static Pool One-Year Transition Matrix
Trough of the Business Cycle

	Rating to (%)								
Initial Rating	AAA	AA	A	BBB	BB	B	CCC	D	N.R.
AAA	**89.02**	9.76	0.61	0.00	0.00	0.00	0.00	0.00	0.61
AA	0.00	**89.95**	7.79	0.00	0.00	0.00	0.00	0.00	2.26
A	0.17	0.67	**90.52**	6.66	0.17	0.00	0.00	0.00	1.83
BBB	0.00	0.82	5.16	**82.07**	5.71	0.54	0.54	0.54	4.62
BB	0.00	0.00	0.00	7.14	**73.95**	7.14	1.68	2.52	7.56
B	0.00	0.34	0.00	0.34	4.80	**68.15**	3.77	13.01	9.59
CCC	0.00	0.00	0.00	1.52	4.55	6.06	**45.46**	30.30	12.12

Panel B.

S&P 1998 Static Pool One-Year Transition Matrix
Peak of the Business Cycle

Initial Rating	AAA	AA	A	BBB	BB	B	CCC	D	N.R.
AAA	**90.30**	6.06	0.00	0.61	0.00	0.00	0.00	0.00	3.03
AA	0.18	**89.64**	5.71	0.18	0.00	0.00	0.00	0.00	4.29
A	0.09	1.46	**87.22**	5.11	0.18	0.00	0.00	0.00	5.94
BBB	0.32	0.00	2.79	**84.93**	4.46	0.67	0.22	0.34	6.59
BB	0.00	0.16	0.16	5.33	**75.44**	5.98	2.75	0.65	9.21
B	0.00	0.00	0.15	0.62	6.16	**76.27**	5.09	4.47	7.24
CCC	0.00	0.00	3.33	0.00	0.00	20.00	**33.33**	36.67	6.67

N.R. Indicates no rating at the terminal date.

Ratings Drift

Introduction

After initial issuance and assignment of ratings, the ratings agencies perform both periodic and market-based reviews of those ratings. Often these reviews result in change, or drift, in their ratings signifying a change in overall credit quality. There are three sources of information on ratings drift. The first two are from the academic arena, including studies by Altman and Kao, (19991a, 1992b, 1992a, 1992b) which use data for all S&P ratings from 1970 to 1989. The second set of studies uses Moody's data, which spans a longer time period. These studies include Lucas and Lonski (1992), Carty and Fons (1993) and Carty (1997). The third source includes is the set of periodic studies that Moody's and S&P release. In light of the dramatic changes to the ratings universe discussed in the previous section, the time period chosen is as important as the study one examines. The remainder of this section briefly summarises the literature on ratings drift over various time horizons, ratings issuers and transition methodology.

Ratings drift: a comparison

The observed stability and performance of the transition matrices varies across the ratings agencies and independent researchers. Caouette *et al* (1998) attempt to put this issue in perspective by examining transition matrices for three different time horizons. These transition matrices, reproduced in Tables 6, 7, and 8, compare the two major raters and the Altman and Kao approach, which includes withdrawn ratings. The principal limitation when comparing them is that the transition matrices cover different time periods. The Moody's transition matrices are for the 1938-1996 cohorts, the S&P average ratings transitions are for their static pool of bonds for the years 1981-1996, and the Altman and Kao (1992) results are for 1971-1989 time period. Given the secular changes that occurred over this time period, the comparisons should be made with caution. Still the tables yield some interesting findings about the Moody's and S&P approach as compared to the Altman and Kao approach, as well as some differences in ratings drift between the two major rating companies.

Whatever methodology is chosen, the longer the time horizon, the less stable the ratings. For example, as displayed in Table 6, Altman and Kao find that 94.3% of the AAA issues retain the rating after one year; Moody's reports this figure at 88.3%, and S&P reports it at 88.5%. Table 7 shows that those figures are 69.8%, 60.8%, and 54.0% over five years, for Altman and Kao, Moody's, and S&P, respectively. As the time horizon lengthens, Caouette *et al* report that the differences between the rating agencies' results and the Altman and Kao results begin to widen. As they explain, this is due to two factors: the "ageing effect" and the omission of the withdrawn ratings from Altman and Kao's observations. Because the Altman and Kao tabulations incorporate the fact that issuers face a changing risk or hazard of a ratings changes over time, the more stable results using their methodology provides strong evidence of the "ageing" phenomenon. Carty (1997) analyses the impact of the withdrawn category, and finds that after correcting for this difference that the one-year transition matrices for the rating agencies begin to converge on the Altman and Kao results. Caouette *et al* also note that the Altman and Kao results diverge from the ratings' companies results and that these differences are most pronounced at the lower end of the quality spectrum. For every credit rating and time horizon they find a higher percentage of issuer retaining their ratings. When comparing Moody's and S&P ratings, Caouette *et al* find that the matrices diverge after five years but they do not offer any explanation except the different time periods under investigation.

Altman and Kao (1992), using newly issued ratings from S&P data analyse the ratings migration in four separate sub-periods – 1970-79, 1980-89, 1977-82 and 1983-1989. They find that over a one- to five-year horizon that AAA-rated issues had the greatest stability. As Altman (1992) argues this is not a surprising result given that they only can go in one direction – downward. When looking past a five-year horizon, however, they find that A ratings were the most stable ratings categories for years 6 through 10. The authors also find that BB-rated issues are the least stable– only 86.1% retained their ratings after one year, 40.8% over 5 years, and 21.6% over ten years.

Altman and Kao (1992) also examine movements in ratings given the direction of the first change. As they note, ratings changes are the norm rather than the exception, so they pose the question of whether initial changes reveal anything about future ratings changes. They find significant serial correlation when the initial change is a downgrade and none when the initial change is an upgrade. They test these results for various sub-periods and find them fairly robust to time periods and issuer industrial classification.

Table 6: **One-Year Transition Matrix**

	Aaa AAA	Aa *AA*	A A	Baa *BBB*	Ba *BBB*	B *B*	Caa *CCC*	Def.	RW
AAA (A/K)	**94.3**	5.5	0.1	0.0	0.0	0.0	0.0	0.0	--
Aaa (M)	**88.3**	6.2	1.0	0.2	0.0	0.0	0.0	0.0	4.3
AAA (S&P)	**88.5**	8.1	0.7	0.1	0.1	0.0	0.0	0.0	2.6
AA	0.7	**92.6**	6.4	0.2	0.1	0.1	0.0	0.0	--
Aa	1.2	**86.8**	5.8	0.7	0.2	0.0	0.0	0.0	5.4
AA	0.6	**88.5**	7.6	0.6	0.1	0.1	0.0	0.0	2.4
A	0.0	2.6	**92.1**	4.7	0.3	0.2	0.0	0.0	--
A	0.7	2.3	**86.1**	4.7	0.6	0.1	0.0	0.0	6.0
A	0.1	2.3	**87.6**	5.0	0.7	0.2	0.0	0.4	3.6
BBB	0.0	0.0	5.5	**90.0**	2.8	1.0	0.1	0.3	--
Baa	0.0	0.3	3.9	**82.5**	4.7	0.6	0.1	0.3	7.7
BBB	0.0	0.3	5.5	**82.5**	4.7	1.0	0.1	0.2	5.7
BB	0.0	0.0	0.0	6.8	**86.1**	6.3	0.9	0.0	--
Ba	0.0	0.1	0.4	4.6	**79.0**	5.0	0.4	1.1	9.4
BB	0.0	0.1	0.6	7.0	**73.8**	7.6	0.9	1.0	8.9
B	0.0	0.0	0.2	1.6	1.7	**93.7**	1.7	1.1	--
B	0.0	0.0	0.1	0.6	5.8	**56.3**	3.5	3.5	10.5
B	0.0	0.1	0.2	0.4	6.0	**72.8**	3.4	4.9	12.2
CCC	0.0	0.0	0.0	0.0	0.0	2.8	**92.5**	4.6	--
Caa	0.0	0.0	0.0	0.3	1.3	5.3	**71.9**	12.4	8.8
CCC	0.2	0.0	0.3	1.0	2.2	9.6	**53.1**	19.3	14.2

Source and Key

A/K = Altman and Kao (1992a) newly issued bonds.
M = Moody's (1983-1998) from Carty (1997) - cohort of bonds.
S&P = S&P (1981-1996) from S&P (1997a) - static pool of bonds.
RW - ratings withdrawn.

Table 7: **Five-Year Transition Matrix**

	Aaa AAA	Aa *AA*	A A	Baa *BBB*	Ba *BBB*	B *B*	Caa *CCC*	Def.	RW
AAA (A/K)	**69.8**	23.5	2.9	3.6	0.1	0.0	0.1	0.1	--
Aaa (M)	**60.8**	15.2	4.3	1.0	0.5	0.1	0.0	0.2	18.0
AAA (S&P)	**54.0**	23.5	6.0	1.7	0.5	0.2	0.2	0.2	13.8
AA	2.4	**67.1**	22.5	5.0	1.0	0.3	0.1	1.7	--
Aa	3.4	**54.1**	15.9	3.4	1.2	0.2	0.0	0.6	21.1
AA	2.4	**53.4**	24.4	4.0	0.9	0.8	0.1	0.4	13.7
A	0.4	9.2	**72.0**	15.1	1.9	0.7	0.0	0.7	--
A	0.3	5.9	**55.7**	10.3	2.6	0.7	0.1	0.6	23.4
A	0.2	7.0	**53.4**	14.9	3.0	1.8	0.3	0.7	18.7
BBB	0.4	1.6	19.6	**65.4**	7.6	1.7	1.9	1.8	--
Baa	0.1	0.9	10.0	**47.1**	8.0	2.0	0.3	2.3	29.3
BBB	0.2	1.3	15.5	**41.5**	9.6	3.4	0.8	2.0	25.7
BB	0.0	0.0	7.7	20.4	**40.8**	16.5	7.8	6.8	--
Ba	0.1	0.3	1.9	10.4	**36.5**	8.1	1.3	5.9	35.6
BB	0.1	0.4	2.9	13.4	**19.9**	9.6	1.7	11.4	40.2
B	0.1	0.0	2.3	4.0	7.7	**53.3**	11.8	20.8	--
B	0.0	0.1	0.5	2.4	10.3	**32.2**	3.5	12.9	38.2
B	0.0	0.1	0.6	2.8	9.5	**16.6**	2.5	22.5	45.4
CCC	0.0	0.0	2.6	3.6	2.0	30.7	**26.5**	34.0	--
Caa	0.0	0.0	0.0	1.6	4.0	7.8	**29.6**	28.0	29.0
CCC	0.2	0.0	0.9	2.4	3.5	6.1	**5.4**	42.0	39.5

Source and Key

A/K = Altman and Kao (1992a) newly issued bonds.
M = Moody's (1983-1998) from Carty (1997) - cohort of bonds.
S&P = S&P (1981-1996) from S&P (1997a) - static pool of bonds.
RW - ratings withdrawn.

Table 8: **Ten-Year Transition Matrix**

	Aaa AAA	Aa *AA*	A A	Baa *BBB*	Ba *BBB*	B *B*	Caa *CCC*	Def.	RW
AAA (A/K)	**52.1**	35.6	7.1	4.6	0.0	0.4	0.0	0.2	--
Aaa (M)	**41.6**	19.0	6.1	2.1	0.8	0.2	0.0	0.6	29.6
AAA (P)	**30.7**	24.7	12.0	6.5	0.5	0.0	0.0	1.1	24.6
AA (A/K)	3.5	**45.7**	27.1	19.0	2.4	0.2	0.0	2.1	--
Aa	4.5	**33.4**	19.8	4.9	2.2	0.6	0.1	1.5	33.1
AA	3.1	**30.3**	29.2	6.4	1.5	0.4	0.2	1.8	27.1
A(A/K)	0.8	17.3	**60.9**	20.0	3.4	0.9	0.6	1.1	--
A	0.3	6.5	**38.6**	11.1	3.3	1.1	0.2	2.2	36.7
A	0.5	7.5	**33.5**	15.8	3.9	1.7	0.2	2.4	34.5
BBB(A/K)	0.0	2.8	36.1	**42.3**	8.2	4.6	1.9	4.1	--
Baa	0.8	1.3	11.7	**30.0**	6.4	2.1	0.3	4.1	43.8
BBB	0.3	1.7	14.6	**24.5**	6.1	1.9	0.1	5.2	45.7
BB (A/K)	0.0	0.0	10.3	25.5	**20.6**	12.5	17.2	13.9	--
Ba	0.1	0.3	3.0	10.1	**17.1**	6.1	1.3	9.9	52.1
BB	0.1	0.1	3.7	10.3	**6.6**	3.8	0.5	20.0	54.8
B (A/K)	0.0	0.0	5.7	8.6	6.7	**40.9**	6.6	31.5	--
B	0.0	0.1	0.8	2.7	7.8	**13.8**	2.1	18.6	54.1
B	0.0	0.1	0.7	2.9	4.7	**2.2**	0.6	28.6	61.2
CCC (A/K)	--	--	--	--	--	--	--	--	--
Caa	0.0	0.0	0.0	2.1	3.2	5.1	**13.5**	36.9	39.2
CCC	0.0	0.0	0.6	2.3	4.6	2.9	**0.0**	36.2	53.5

Source and Key

A/K = Altman and Kao (1992a) newly issued bonds.
M = Moody's (1983-1998) from Carty (1997) - cohort of bonds.
S&P = S&P (1981-1996) from S&P (1997a) - static pool of bonds.
RW - ratings withdrawn.

Given the similarities in the approaches S&P and Moody's use to create pools and that the similarities in their ratings universes, it is useful to look at transition matrices for similar time periods and horizons. Table 9 shows both agencies' average one-year transitions over similar time periods. For issuers with a rating above a BB, S&P ratings appear more stable. For example, S&P issues rated AAA, retain their rating 89.48% of the time for a one-year time horizon, while this same figure is 85.44% for Moody's. Similar results hold until we reach the BB rated issues. For issues rated BB and below, Moody's issuers are more likely to retain their ratings over a one-year time horizon. This appears to be due, at least in part, to the fact that S&P is more likely to withdraw ratings for issuers below that grade.

Table 9: Corporate Average One-Year Ratings Transition Matrix: Moody's **and S&P**

Moody's *S&P*	AAA *Aaa*	Aa *AA*	A *A*	Baa *BBB*	Ba *BBB*	B *B*	Caa *CCC*	Def.	RW
Aaa	**85.44**	9.92	0.98	0.00	0.03	0.00	0.00	0.0	3.63
AAA	**89.48**	7.26	0.47	0.08	0.04	0.00	0.00	0.00	2.67
Aa	1.04	**85.52**	9.21	0.33	0.14	0.14	0.00	0.03	3.59
AA	0.62	**88.99**	6.55	0.58	0.06	0.03	0.00	0.00	3.07
A	0.06	2.76	**86.57**	5.68	0.71	0.17	0.01	0.01	4.03
A	0.05	2.18	**87.95**	4.91	0.54	0.01	0.04	0.04	4.07
Baa	0.05	0.32	6.68	**80.55**	5.72	0.95	0.08	0.15	5.49
BBB	0.04	0.25	5.23	**82.66**	4.54	0.16	0.22	0.22	5.95
Ba	0.03	0.07	0.51	5.20	**76.51**	7.40	0.49	1.34	8.46
BB	0.04	0.09	0.55	7.04	**73.98**	7.17	0.92	0.92	9.21
B	0.01	0.04	0.16	0.60	6.07	**76.12**	2.54	6.50	7.96
B	0.00	0.09	0.25	0.41	6.14	**73.15**	4.82	4.82	11.65
Caa	0.00	0.00	0.66	1.05	3.05	6.11	**62.97**	26.16	0.00
CCC	0.16	0.00	0.32	0.64	2.09	10.43	**52.01**	20.39	13.97

M = Moody's 1980-1998 from Moody's Investor Services (1999)- cohort average
S&P = S&P 1981-1998 from S&P (1999) - static pool of bonds.
RW = ratings withdrawn

Conclusion

The observed migration patterns in transition matrices hinge critically on the time period examined, the methodology employed, and the ratings systems. Drift, no matter how it is measured, however, has changed over time. In recent years, there has been a downward trend in ratings drift. This is driven in part by the types of firms obtaining ratings and the fact that lower-rated firms are more volatile. Several transition matrices focusing on different time periods, raters and methodologies from different studies were examined to assist in examining these issues. Given the limited amount of empirical research on the impact of each of these issues, more research needs to be done.

Appendix

Several researchers have argued that the ratings transitions provided by the ratings companies are limited in their use since the "averages" reported are misleading and timeliness of ratings changes distorts their reported stability. For example, Kealhofer, Kwok and Weng (1998) argue that the historical transition (default) rates can deviate significantly from the actual transition (default) rates and that there are substantial differences of default within bond rating grades. They believe that this is true for two reasons. First, they argue that this bias is inherent because of the discrete nature of ratings. Second, they argue that the lack of timeliness in ratings causes a significant bias in transition probabilities – the probability of remaining at the same quality is overstated by about double for most grades, whereas other probabilities are understated.

Second, the issue of ratings timeliness came to a head during the Asian crisis when the ratings agencies downgraded the bonds not long before the time that the information was released publicly.[88]

Kealhofer, Kwok and Weng (1998) examine some of these issues by constructing a default matrix based on EDF default rates rather than ratings grades. [89] They classify firms into different default ranges that are the ratings that correspond to ranges that are typical for a ratings grade (*e.g.* AAA: less than .02%, AA: .03% to .06% and so forth). They construct a One-Year Transition Matrices as tabulated from expected default frequencies for the 1990-1995 by mapping the stated default rates for each grade and then finding the stability of the KMV default equivalent. They find evidence that the EDF's are less stable than ratings, and argue that the agency ratings can be considered relatively sticky.

Table 10: One-Year Transition Rates Based on KMV EDF Ranges

	Rating to (%)							
Initial Rating	1 (AAA)	2 (AA)	3 (A)	4 (BBB)	5 (BB)	6 (B)	7 (CCC)	8 (Default)
1(AAA	**66.26**	22.22	7.37	2.45	0.86	0.67	0.14	0.02
2(AA)	21.66	**43.04**	25.83	6.56	1.99	0.68	0.20	0.04
3 (A)	2.76	20.34	**44.19**	22.94	7.42	1.97	0.28	0.10
4 (BBB)	0.30	2.80	22.63	**42.54**	23.52	6.95	1.00	0.26
5(BB)	0.08	0.24	3.69	22.93	**44.41**	24.53	3.41	0.71
6 (B)	0.01	0.05	0.39	3.48	20.47	**53.00**	20.58	2.01
7 (CCC)	0.00	0.01	0.09	0.26	1.79	17.77	**69.94**	10.13

[88] See Caouette et al (1998) p.79 or the Economist (1997).

[89] The use also publicly traded companies, not only those with implied senior default ratings.

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Section III.C. Consistency across Sectors

Introduction

The Basel Committee has proposed a greater reliance on external ratings to determine the risk weighting of banking book assets. According to the proposed new standardised approach, the risk weighting may depend both on credit rating and sector (i.e. sovereigns, banks, or corporates). Sovereign credits have reduced risk weightings relative to banks at all ratings A and higher[90], and at all ratings relative to corporates at BBB and higher. Bank credits have lower risk weightings than corporate credits at A and BBB ratings. At other ratings, the charges are identical across sectors.

This paper examines the extent to which sectoral differences exist for default rates and recoveries in cases of default. Consistent with the distinctions of the new approach, we focus on the differences among sovereign, bank, and corporate ratings. When biases are apparent, are they consistent with the asymmetries in the weights proposed by the Basel Committee? Identical risk weights across sectors may be most effective when ratings in different sectors reflect similar levels of expected loss; different weights may be most effective when ratings reflect different levels of expected loss.

Both the literature on this topic, and our own analysis to follow, are based on the historical experience of the ratings of the two major agencies, Moody's Investors Service and Standard and Poor's. Since a downgrade to a lower rating implies that an eventual default is more likely, we also examine sectoral differences in the degree of downgrade risk.

We also investigate the extent to which obligor domicile has affected the association of credit ratings with default probabilities, recoveries, and downgrades. Most historical credit rating and default data are the ratings of US entities, and issued by Moody's and S&P, agencies headquartered in the United States. If, as some suggest, the new standardised approach greatly increases the importance of Moody's and S&P's ratings of non-US entities, then the degree to which these ratings are consistent across obligor domicile is of interest. International differences in accounting and legal systems, business practices, and the role of government in the economy may make it difficult to compare the default risk of bond issuers domiciled in different countries.

Our empirical results suggest that Moody's and S&P have not been completely successful in calibrating their ratings so that like-rated bonds of different sectors are exposed to similar levels of default risk. US banks experienced significantly more defaults than US industrial firms over this period, taking the year and Moody's rating as given. US non-bank financial firms have had greater defaults than US industrial firms, taking the year and S&P rating as given. These results are at odds with the proposal that, for some rating levels, bank and securities firm obligations carry a lower capital requirement than an otherwise identical liability of an industrial firm. Nevertheless, it is worth noting that our sample period may be somewhat atypical for the US in that it included an interval in which an unusually large number of depository institutions failed.

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[90] Here we ignore the proposed first option for weighting claims on banks, based on the rating of the sovereign in which it is domiciled, and consider only the second option based on the bank rating itself.

Limited availability of data on the ratings of non-US firms made it difficult to reach statistically robust conclusions as to whether the rating agencies have been more successful in calibrating their ratings across geographically distinct issuers. Apparent geographical discrepancies in default rates are no longer significant once we simultaneously control for the credit rating and time period.

Overview of literature

The literature on sectoral differences in the measurement of credit risk is fairly limited. One area of focus is split ratings, that is, when the same issuer receives different ratings from the various agencies. The literature also covers the association of ratings and spreads, and the association of ratings with subsequent outcomes, including rating transition and default. A number of the studies report evidence of sectoral differences in indirect measures of the risk of default loss, such as yield spreads, the relative likelihood of subsequent upgrades and downgrades, recovery rates, and the frequency of split ratings, which are understood to reflect uncertainty about the issuer's credit quality. In particular, results in this literature suggest that, holding ratings constant, bank bonds may be riskier than industrial bonds, but the results are mixed for comparisons between sovereign and corporate bonds and for geographical distinctions. Few papers address default rates directly, and we know of no previous work that undertakes a systematic statistical analysis of sectoral differences in default rates.

Turning to split ratings, Donald Morgan (1998) measured the frequency of credit rating agency disagreement in the banking versus other sectors. Consistent with Cantor and Packer (1994), he finds that split ratings tend to be more frequent in banking than in other sectors. Cantor and Packer (1995) find that split ratings are more common for lower-rated sovereigns than lower-rated US corporates and less common for higher rated (AAA/AA) rated sovereigns than higher-rated US corporates. These results suggest greater opacity in the measurement of credit risk for banks relative to corporates, for lower-rated sovereigns relative to corporates, and less opacity for higher-rated sovereigns relative to corporates. The first result may be inconsistent with one of the asymmetries of the new proposed capital charges (the lower capital charge for banks relative to corporate credits at some rating levels). The last result may be consistent with another asymmetry (the lower capital charge for sovereigns relative to corporate credits at some rating levels).

With regard to obligor domicile, two papers merit mention. An examination of split ratings by Beattie and Searle (1992) suggests that agencies judge issuers from their own country more leniently. However, Cantor and Packer (1994) found that, for ratings of international banks, observed differences between home and foreign ratings reflected principally differences in the scales of individual ratings agencies, rather than home-country bias.

The relationship of ratings and spreads also appears to differ by sector. Cantor and Packer (1995), and Jackson and Perraudin (1999) document a tendency for spreads to be higher for sovereign credits at lower credit ratings (BBB and lower) than similarly rated corporate credits. While this may be due to lower expected recovery on defaulted sovereign bonds than corporate bonds, there is too little recent history of defaulted sovereign bonds to test this explanation. Spreads on bank debentures also appear to have been greater throughout the 1990s than spreads on comparably rated corporate bonds (Jackson and Perraudin, 1999). Recoveries might account for some of this difference, as Altman and Kishore (1996) report US industry differences in "recovery" (i.e. salvage) rates on defaulted bonds, and finds that financial institutions tend to have lower recovery rates than industrials.

Nickell, Perraudin, and Varotto (2000) focus on rating "transitions" (also known as rating "migrations"), and find that banks tend to have less stable ratings than industrials. Higher rated banks have more downgrades, but lower-rated banks are upgraded more often than lower-rated industrial issuers are. Jackson and Perraudin (1999), drawing on a table in the above study, report that over 1-year horizons, banks rated B suffer fewer bond defaults than B-rated industrial issuers, although the difference is not statistically significant. Comparing sovereigns with other issuers, S&P (1999) has reported greater stability for sovereign ratings than corporate ratings. However, S&P's brief does not take account of the far greater frequency of withdrawn ratings in the corporate sector, nor does it address issues of statistical significance raised by the relatively small number of observations for sub-prime sovereigns.

With regard to distinctions between US and non-US companies, Nickell et al. (1998) find that higher-rated Japanese firms are more likely to be downgraded by Moody's and that lower-rated Japanese firms were less likely to be upgraded. Another analysis of ratings in Japan suggests that the Japanese ratings of Moody's Investors Service may be relatively tough, since fewer defaults have been observed over time in Japan than would have been predicted by Moody's ratings, despite Japan's stagnant economic conditions in the 1990s (JCIF, 1999).

Limitations of the analysis

Our empirical analysis uses the ratings history of rated issuers from the two largest credit rating agencies in the world, Moody's (for issuers with rated bonds outstanding during the period 1970-1998), and S&P (for the period 1981-1998). The focus on these two agencies is an unavoidable limitation of the analysis. Clearly the proposed framework does not envision the external credit ratings that apply to be only those of the largest two agencies; however, these are the only two rating agencies that provide sufficient data for a sectoral comparison of the association of ratings with defaults, recoveries, and downgrades.

Another limitation of the analysis is that even Moody's and S&P do not provide historical data on their ratings in all sectors. The performance of securities rated in the lucrative and extensive areas of municipal finance and structured finance are not part of the publicly available databases of Moody's and S&P. Some questions have been raised with regard to the stability of ratings standards in the area of structured finance (Cantor and Packer, 1994). The municipal finance area is one in which ratings are suggested to be much tougher and associated with lower default probabilities than other sectors even by the rating agencies themselves (for example, Moody's, 1999). However, the data are simply not available to investigate the performance of ratings in those industry sectors relative to other sectors.

To the extent that the disclosure of ratings histories is a signal of the stability and dependability of those histories, we should expect the ratings inconsistencies observed across sectors and across countries to be a lower bound of the unobserved inconsistencies that may exist more generally.

Descriptive statistics: default rates by sectors

Table 1 reports the one-year default rates by initial rating and sector of issuer, according to the Moody's database, which covers defaults between 1970 and 1998. The default rates are calculated using estimates of mid-period denominators, constructed by subtracting half of the number of ratings withdrawn (over the whole period) from the number of rated issuers at the

beginning of the period. Rating withdrawals are generally not adverse credit events (Carty, 1997).

Default rates are measured across seven sectors—US banks, other US financial firms, US non-financial firms, non-US banks, other non-US financial firms, non-US non-financial firms, and sovereigns. In terms of overall default rates, the default rate for US banks of 1.43% is about the same as that of US non-financial firms. Both are well above the default rate of 0.50% for non-US non-financial firms, which in turn is higher than the 0.08% default rate for non-US banks. Based on these numbers alone, it appears that US firms are riskier than non-US firms are, and non-US banks are particularly safe. Sovereigns had incurred just one bond default since 1983 on a foreign-currency obligation rated by Moody's. [91]

However, overall sectoral default rates indicate little about sectoral differences in the correspondence of ratings to default, since the underlying ratings composition of each sectoral pool of borrowers is likely to differ. For instance, if the average ratings of US banks were much higher than those of US non-financial firms, the similar default rates would imply that ratings were relatively lenient for banks. Or, if the average ratings of non-US firms were much higher than for US firms, the observed difference in the default rates may result purely from this difference of ratings composition.

In Table 2, we control for the ratings composition and report the default rates for US and non-US firms at each Moody's rating level. We report both one-year and five-year default rates. In both cases, estimates of mid-period denominators are constructed by subtracting half the number of withdrawn ratings, as before. [92] The five-year default rates are the average outcomes for annual cohorts from January 1970 to January 1994. At a one-year horizon, US firms rated Ba show a slightly higher propensity to default (1.3% vs. 0.8%) ; those rated B and in the Caa/Ca/C range also show a higher propensity to default (6.9% vs. 2.4% for B's, and 20% versus 15% for CCCs). Not surprisingly, measuring defaults at a five-year horizon results in higher default rates at each rating level. At each rating category other than Aaa, the likelihood of default over a five-year horizon is noticeably greater for US firms. These figures suggest that, during the sample period, Moody's was more conservative in its rating of non-US than US firms, but with very limited data for non-US companies at the lower rating levels, it is difficult to reach a definitive conclusion from this comparison.

In Table 3, we again control for the ratings composition and this time report the one and five-year default rates for US banks and non-financial firms at each Moody's rating level. At a one-year horizon, US banks rated Ba show a slightly higher propensity to default than US non-financial firms (1.9% vs. 1.3%), and the default rates are higher in the B and Caa-C ranges as well (13.8% vs. 6.6% for B's, and 56.4 versus 18.8% for Caa-C). Again, measuring defaults at a five-year horizon results in more defaults at each rating level, and more striking, but consistent, sectoral differences. At each rating category other than Aaa, the likelihood of default over a five-year horizon is significantly greater for US banks. At least during the

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[91] The default was a late payment on a Eurobond by Pakistan in 1998, which was not considered a default under S&P's definition because the coupon was disbursed within the contractual grace period.

[92] The implicit assumption in this construction is that ratings withdrawals are distributed evenly through the period. The mid-period denominator produces a measure of the default rate that is close to the average "hazard rate" of default.

sample period, Moody's was more conservative in its rating of US non-financial firms than US banks.[93]

Probit regression analysis

Of course, the distinctions noted in Tables 2 and 3 could be a reflection of factors other than genuine sectoral differences. Differences over time in the frequency of sectoral ratings, combined with different default patterns across time, could account for the differences. For instance, there has been a much greater percentage of Moody's ratings, particularly at the lower rating levels, assigned to non-US borrowers since the mid-1990s than previously. It may also be stated that, while the condition of US firms improved from the late 1980s-early 1990s to the mid-1990s, non-US firms were going through different economic conditions in their respective countries.

Table 4 presents summary results for four multivariate probit models that we estimated, where the dependent variable, estimated over thousands of "issuer-years", is the probability that the issuer defaulted that year. (Full details of the estimated model coefficients from which these statistics are derived appear in Appendix Table A1.) The explanatory variables include an indicator for each year to control for time-varying effects, an indicator variable for each rating level below A3 or A-, and indicator variables for four broad issuer classes: US non-financial firms, US banks, other US financial firms, and all non-US firms. [94] (Sovereigns were excluded from this exercise because, with only a few dozen low-rated issuer-years skewed toward the late 1990s, both the actual and expected number of defaults were clearly too low to make reliable inferences.)

Because the probit representation is based on a non-linear multivariate function, individual parameter estimates are difficult to interpret out of context. To facilitate interpretation of the results, we compute an estimated probability of default for each sector over all of the issuer-year observations in the sample, using the estimated parameters for year, rating and sector, and for each computation assuming that all of the observations came from a single sector. The sectoral statistics presented in Table 4 represent the difference in this estimated probability of default for the indicated sector relative to that for the US non-financial sector. For example, for the restricted model in the first column, in which the three classes of US firms are treated as a single group, the average "fitted" one-year default probability is estimated to be a hair higher (by 0.09%) for non-US firms than US firms. (Note, however, that the difference is *not* distinguishable from zero with 95% confidence.) Since the amount of non-US default data is limited, it is impossible to derive definitive conclusions from the analysis. However, it may be that the apparent "home bias" in ratings in Table 2 is a result of time effects.

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[93] Higher default rates for US banks relative to US non-financial firms are also apparent from S&P data (avai lable for years 1981-1998).

[94] The dearth of same-year defaults of A and Aa-rated credits (a total of 2 in the Moody's sample and 6 for S&P, in both cases out of thousands of issuers) posed practical obstacles for including dummy variables for high ratings in the probit specification.

The results in the next column, however, show that the higher frequency of US bank defaulters at a given Moody's rating (compared to US non-financial firms, as documented in Table 3), is both robust to time effects and statistically significant. The average default rate is 0.77% higher for the full sample, and a striking 2.29% higher for the "junk bond" portion of the sample. The results are slightly different for S&P ratings, with other US financial firms showing a statistically significant elevation in default rate.

Caveat

While the probit results are indicative of statistical significance, it is important to note that the default-rate discrepancies, with regard to Moody's ratings of US banks and US non-financial firms, result mainly from one historical episode – the thrift crisis of the late 1980s and early 1990s. Table 5 indicates that 21 of the 33 bank defaults for the whole period of 1970-1998 were of US thrifts in 1989-1991. More than 40% of the 49 rated thrifts at the beginning of 1989 defaulted. In retrospect, Moody's greatly overestimated the ability of thrifts to make it through the years 1989-1991 without default. To the extent that there have been dramatic changes in the US bank regulatory regime, and the methodology for rating banks has been adjusted to account for them, bank ratings have not necessarily been more lenient, that is, associated with higher default rates at a given credit rating, subsequently.

Interestingly, the thrift crisis did not have the same impact on estimated sectoral default rates by S&P rating. Only 10 issuers in the US bank category (which includes thrift institutions) rated by S&P defaulted during 1989-1991. The disparate experiences arose at least in part because S&P rated substantially fewer of the speculative-grade depository institutions than Moody's at that time.

Recovery rates

Since expected losses are a function of both the expected probability of default and the expected severity of loss given default, sectoral differences in the probability of default at given ratings do not necessarily imply sectoral differences in expected losses. If they were counter-balanced by differences in recovery rates, then the expected losses could be the same across sectors. And in contrast to S&P, which says that its ratings are meant to rank the relative likelihood of corporate default, Moody's explicitly indicates that it includes considerations of recovery in its corporate ratings.

The most detailed paper to date on recoveries by industry is by Altman and Kishore (1996), the results of which are reproduced in Caouette et al (1996). Altman and Kishore use S&P's convention of measuring recoveries as the market price of the bonds as a percentage of face value shortly after default. The recoveries on the defaults of the 66 financial institutions averaged 35.7%, below the 41% average on all 696 defaults. The lower default rate did not appear to be a function of lower seniority since around two-thirds of the financial institution issues were senior secured or senior unsecured obligations, relative to less than one-third for the entire sample. Thus, recoveries have been lower for financial institutions, opposite to what we should expect if recoveries were counterbalancing the higher default rates of banks.

Moody's database allows for a more recent examination of the degree to which recoveries, and by extension, expected losses, could differ by industry. Moody's measures a recovery rate as the secondary market prices of a bond 30 days after default. The database reports

recoveries on the bonds of 595 issuers that were rated by Moody's and defaulted between 1970 and 1998. In the case of multiple classes of bonds outstanding for any one firm, we take the weighted average of recoveries for that firm.

In Table 6, we report the recovery rate on the defaulted corporate bonds, broken out in the first two rows by US bank versus US non-financial firms, and then in the next two rows, by US versus non-US firms. (The absence of a separate category of US non-bank financial firms explains why the first two rows do not quite add up to the third.) The US bank recoveries are starkly lower, with an average recovery of 22% versus around 40% for non-financial firms. The statistic resulting from the t-test on the differences is 3.8, indicating statistical significance beyond the 95% confidence level. By contrast, the average recoveries for the 31 rated bonds of non-US firms that defaulted is 42%, which does not differ significantly from the sample of 565 rated US firms alone.

It is possible that differences in the average seniority of the bonds issued by firms in different sectors, or of the bonds issued by firms domiciled in countries outside the US could be distorting the results. If bank obligations tended to be less senior than non-financial obligations, that could explain some of the differences in recoveries that we see. Conversely, if US firm obligations tended to be more junior than those of non-US firms, that could be masking differences in recoveries that are not apparent in the aggregate sample. To partially control for sectoral differences in the level of seniority, we recalculate recovery rates by sector for subordinated bonds only, reported in Table 7. The sample size decreases from 596 to 358 issuers. The difference in average recovery between US banks and non-financial companies remains large (19.9% vs. 35.5%), and at high levels of statistical significance (t-statistic equals 3.1)[95]. The difference in recoveries between US and non-US firms has increased somewhat (from 3.1% to 6.3%), but remains statistically insignificant. Only five of the thirty-one non-US defaulted bond issuers with available data on recoveries had subordinated bonds outstanding.

In conclusion, it appears that the differences in default rates between US banks and US non-financials were not counterbalanced by the differences in recoveries on those defaults. If anything, the recoveries tended to be much lower for US banks than those for US non-financial firms. However, keeping in mind that neither result is statistically significant, the slightly lower default rates for US relative to non-US firms may have been accompanied by somewhat lower average recovery rates.

Downgrade rates

Downgrades reflect an increased likelihood of default of an obligation in future periods. Thus, if two bonds are subject to equal near-term default risk, the instrument with greater downgrade risk would likely have more longer-term default risk. Similarly, it may be appropriate for two bonds with differing short-term default prospects to carry the same credit rating if the bond that is less likely to default in the near term has, at the same time, more vulnerability to a gradual deterioration in credit quality – i.e. greater downgrade risk.

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[95] One caveat with respect to this comparison is that subordinated bank bonds may not be of equivalent seniority to subordinated industrial bonds, given that deposit liabilities are senior to all bank debentures in the United States.

While default rates over a long horizon, such as 10 years, also measure long-term credit risk, analysis using such measures must impose a cut-off year for initial ratings in the relatively distant past. Thus, an important complementary question in assessing the consistency of ratings across sectors may be whether the likelihood of a default *or* downgrade, controlling for initial rating level, is consistent across sectors – or at least whether any differences are offsetting.

Table 8 shows downgrade rates for sovereign and other issues by the beginning-of-period Moody's and S&P's credit ratings for the period 1981-1998. The shorter period is utilised since the S&P data are available from that year. For the purposes of our analysis, an issuer is considered downgraded if its rating on unsecured senior debt moves from one letter-grade category to a lower letter-grade category, or if it defaulted. (Thus, downgrades within letter grades—e.g. from A1 to A3—are not counted.) Again, one-half of the withdrawn issuers are removed from the denominator, and rates at both one-year and five-year horizons are reported.

Table 8 indicates that sovereigns have shown strikingly lower downgrade rates at both the one-year and five year horizons at the highest rating levels of Aaa (AAA), Aa (AA), and A than other entities rated by Moody's and S&P. For example, 38% of all firms rated Aa by Moody's were downgraded over a five-year horizon versus 5% of all sovereigns. At least in terms of the direction of the bias, these are consistent with the lower risk weights placed on sovereign credits in the proposed standardised approach. However, in the categories of Baa, where sovereign credits also have lower risk weights relative to corporates, the downgrade rates are higher for sovereigns than corporates.

Downgrade rates for sovereigns in the non-investment grade ranges [Ba (BB), B] appear similar to other firms at the one-year time horizon, but lower at the five-year horizon. Since our calculation of downgrade rates at a five-year horizon utilises annual cohorts based on initial ratings only through 1994, there were very few sovereign observations at the Ba and B grade levels, and the lower downgrade rates should not be taken too seriously.

Table 9 again reports downgrade rates, but this time comparing US and non-US firms. Here the results are mixed, and Moody's and S&P ratings provide contrasts. Among the differences in Moody's ratings between US and non-US firms, the differences in one-year downgrade rates are noticeable only at Baa (6.3% for US vs. 8.4% for non-US) and B (9.7% for US vs. 6.8% for non-US) and Caa-C (18.9% for US vs. 15.2% for non-US). Given a Moody's low rating, non-US firms are less likely to be downgraded or default within a year. However, given a low S&P rating, non-US firms are more likely to be downgraded.

At a five-year horizon, Moody's and S&P downgrade rates are more closely in line with each other. Moody's data indicate that non-US firms were more likely to be downgraded from Aaa than US firms, but that US firms at every subsequent rating category were more likely to be downgraded than non-US firms. The differential in downgrade rates were especially large in the lower rating levels: 30.5% vs. 18.8% for Ba's, 35.3% vs. 28.9% for B's, and 47.1% vs. 15.4% for Caa-Cs. S&P results also show higher downgrade rates for US firms, though in a somewhat more limited rating area--A, BBB, and BB, and B. However, the difference in downgrade rates at S&P's BB (26.6% for US firms vs. 9,4 % for non-US firms) and B (30.9% vs. 9.6%) rating levels are particularly large. At the same rating level, US firms have faced greater downgrade risk than non-US firms.

Table 10 reports the downgrade rates for US banks versus US non-financials. With Moody's data, for higher-grade credits rated Aaa and Aa, US banks have been far more likely to be downgraded than US non-financials, both at one and five-year terms. While flattening for the medium rating levels (A, Baa), the difference again is apparent at both one and five year-terms for non-investment grade ratings—for example, Ba, B and Caa-C.

The results using S&P data, though somewhat weaker, are basically consistent with those using Moody's. While AAA/AA rating levels are associated with more US bank downgrades than US non-financials, non-financials tend to have higher downgrade rates for the A/BBB middle region. Banks have significantly lower downgrade rates in the B rated area.

As with the default rate analysis, we test for the independent influence of sectoral distinctions on the likelihood of a downgrade by estimating multivariate probit models, and using the estimated coefficients to compute implied sectoral differences (Table 11). The dependent variable is the probability of a letter-grade demotion or default. The explanatory variables are the same as for the default probits presented in Table 4, except that a sovereign issuer indicator dummy, as well as dummy variables for Aa and A rating levels, can now be included. (Full details of the estimated model coefficients from which the reported statistics are derived appear in Appendix Table A2.) S&P's somewhat lower downgrade rates for sovereigns relative to corporate issuers (documented in Table 8) turn out to be both robust to calendar dummies and statistically significant. The mixed results of the US versus non-US comparisons (from Table 9) now result in significantly higher downgrade rates for non-US firms, once the relative abundance of non-US ratings in more recent years (which saw a lower-than-average overall rate of downgrades) is taken into account. [96] Finally, consistent with the figures in Table 10, US banks have been significantly more prone to downgrades than US non-financial firms.

Conclusion

In summary, we find limited evidence that Moody's and S&P's ratings have been imperfectly calibrated across issuer sectors in the past. In particular, for a given credit rating, default rates seem to be higher for US financial firms than for US corporates, but the difference between US firms and those domiciled in other countries seems to be insignificant. However, it must be stressed that taking into account the limited amount of non-US data available for the current study, further analysis is necessary. Sectoral differences in downgrade rates and recovery rates do not offset the higher default rate for US banks, in terms of overall credit risk. However, particularly if bank supervision has become more effective or credit ratings have adjusted, one would not necessarily expect US bank default rates to be higher going forward. The topics of a few recent reports (for example, S&P, 1999; and Moody's, 1999a) published by rating agencies suggest that they are paying increasing attention to sectoral comparisons.

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[96] It is possible that US issuers have been less prone to downgrades over the last few years due to unexpectedly favourable macroeconomic conditions. The economic climate in the United States since the mid-1990s has been particularly outstanding, while Japan and some of the emerging market economies (which account for an increasing proportion of credit ratings) have experienced a much bumpier ride.

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Table 1 One-Year Default Rates by Type of Issuer (1970-1998)			
Type of Issuer	Default Rate (%)	Number of Defaults	Effective Denominator
US Banks	1.43	33	2300
Other US Financial Firms	0.78	35	4469
US Non-Financial Firms	1.42	516	36252
Non-US Banks	0.08	2	2400
Other Non-US Financial Firms	0.12	3	2430
Non-US Non-Financial Firms	0.50	20	4027
Sovereigns	0.14	1	698
Total	1.16	610	52576

Notes: Default rates are calculated using estimates of mid-period denominators, constructed by subtracting half of the number of ratings withdrawn (over the whole period) from the number of rated issuers at the beginning period. Rating withdrawals are generally not adverse credit events. Moody's calculates one-year default rates the same way as we do.

Table 2 Default Rates by Initial Moody's Credit Rating: US vs. Non-US Firms (1970-1998)				
	One-Year Horizon		Five-Year Horizon	
Credit Rating	US Firms	Non-US Firms	US Firms	Non-US Firms
Aaa	0/1732.0 = 0.0%	0/1032.5 = 0.0%	0.1%	0.3%
Aa	0/4499.5 = 0.0%	2/2577.0 = 0.1%	0.4%	0.2%
A	1/12306.0 = 0.0%	0/2778.0 = 0.0%	0.6%	0.2%
Baa	13/10389.0 = 0.1%	1/1214.0 = 0.1%	1.8%	0.9%
Ba	114/8487.0 = 1.3%	6/754.5 = 0.8%	11.6%	7.8%
B	350/5082.5 = 6.9%	11/468.0 = 2.4%	31.4%	23.5%
Caa, Ca, C	106/524.5 = 20.2%	5/33.0 = 15.2%	50.2%	15.4%

Notes: Default rates are calculated using estimates of mid-period denominators, constructed by subtracting half of the number of ratings withdrawn (over the whole period) from the number of rated issuers at the beginning of the period. Rating withdrawals are generally not adverse credit events. Moody's calculates one-year default rates the same way as we do, but they use a different methodology for multi-year default rates. Five-year default rates are for annual cohorts from January 1970 to January 1994.

Table 3
Default Rates by Initial Moody's Credit Rating:
US Banks vs. US Non-Financial Firms (1970-1998)

	One-Year Horizon		Five-Year Horizon	
Credit Rating	Banks	Non-Financial	Banks	Non-Fin.
Aaa	0/112.5 = 0.0%	0/1288.5 = 0.0%	0.0%	0.1%
Aa	0/371.0 = 0.0%	0/3253.5 = 0.0%	2.5%	0.3%
A	0/1093.5 = 0.0%	1/9595.0 = 0.0%	2.2%	0.4%
Baa	0/322.0 = 0.0%	11/9178.5 = 0.1%	5.5%	1.6%
Ba	5/258.0 = 1.9%	102/7717.0 = 1.3%	28.2%	11.0%
B	17/123.0 = 13.8%	315/4755.5 = 6.6%	47.6%	30.8%
Caa, Ca, C	11/19.5 = 56.4%	87/464.0 = 18.8%	70.6%	51.7%

Notes: Default rates are calculated using estimates of mid-period denominators, constructed by subtracting half of the number of ratings withdrawn (over the whole period) from the number of rated issuers at the beginning of the period. Rating withdrawals are generally not adverse credit events. Moody's calculates one-year default rates the same way as we do, but they use a different methodology for multi-year default rates. Five-year default rates are for annual cohorts from January 1970 to January 1994.

Table 4 **Average Implied Sectoral Differences in One-Year Default Rates** **Percent, Relative to US Non-Financial Firms, from Probit Model**				
Variables Controlled for in Estimation	Moody's Rating (Alphanumeric); Year Dummies		Standard & Poor's Rating (Letter Grade only); Year Dummies	
Sample Period	1983-1998		1981-1998	
US sectors have same expected default rates	Restricted	No	Restricted	No
Average Implied Difference Over All Rating Levels: (t-statistic for sector parameter in parentheses)				
US Banks		**0.77** **(2.37)**		0.06 (0.23)
Other US Financial Firms		0.34 (1.36)		**0.63** **(2.03)**
All Non-US Firms	0.09 (0.36)	0.14 (0.55)	0.14 (0.58)	0.17 (0.71)
Average Implied Difference Over Speculative Grade Rating Levels Only:				
US Banks		**2.29**		0.21
Other US Financial Firms		1.03		**2.07**
All Non-US Firms	0.28	0.41	0.47	0.57

Notes: Differences in **boldface** are statistically significant with 95% confidence. Rating level dummy variables are included only for Baa1 (Moody's) and BBB (S&P) and lower, because of scarcity of defaults at higher ratings. See Appendix Table A1 for estimated coefficients.

Table 5 US Thrift Defaults from Moody's January 1989 Cohort					
		Defaults			
Credit Rating	Number of Issuers	1989	1990	1991	1989-1991
Aaa	2	0	0	0	0
Aa	0	0	0	0	0
A	6	0	0	0	0
Baa	9	0	1	1	2
Ba	19	1	4	3	8
B	11	5	3	1	9
Caa- C	2	2	0	0	2
Total	49	8	8	5	21

Table 6 Recovery Rates on Defaulted Corporate Bonds (1970-1998)					
Type of Issuer	Number of Cases	Face Value USD Billion	Average Recovery (percent)	Difference	T-statistic
US Bank	26	2.7	22.0		
US Non-Financial	515	88.5	39.9	**17.9**	3.8
US Firm	565	96.9			
Non-US Firm	31	7.6	42.0	3.1	0.7
Total	596	104.4	39.0		

Note: comparisons in **bold** are statistically significant with 95% confidence. Moody's measures recovery rate as the secondary market price of a bond 30 days after default, without regard to earlier prices or other features of the bond.

Table 7 Recovery Rates on Defaulted Corporate Bonds Subordinated Bonds Only (1970-1998)					
Type of Issuer	Number of Cases	Face Value USD Billion	Average Recovery (percent)	Difference	T-statistic
US Bank	20	1.7	19.9		
US Non-Financial	318	36.0	35.5	**15.6**	3.1
US Firm	353	40.5	34.1		
Non-US Firm	5	1.4	40.4	6.3	0.6
Total	358	41.8	34.2		

Note: comparisons in **bold** are statistically significant with 95% confidence. Moody's measures recovery rate as the secondary market price of a bond 30 days after default, without regard to earlier prices or other features of the bond.

Table 8
Downgrade Rates (%) by Initial Moody's and Standard and Poor's Credit Rating: Sovereign vs. All Firms (1981-1998)

	One-Year Horizon		Five-Year Horizon	
Credit Rating	Sovereign	All Firms	Sovereign	All Firms
(Moody's) Aaa	7.0	11.7	27.9	39.3
(S&P) AAA	*3.2*	*8.0*	*19.1*	*30.6*
Aa	1.2	10.2	5.2	38.0
AA	*1.6*	*7.4*	*1.5*	*30.7*
A	2.5	6.6	4.9	20.9
A	*1.2*	*5.9*	*12.1*	*21.1*
Baa	10.9	6.7	26.1	15.1
BBB	*6.7*	*6.1*	*21.7*	*16.2*
Ba	15.0	10.0	12.5	30.0
BB	*10.0*	*9.5*	*27.8*	*26.1*
B	3.6	9.4	0.0	35.2
B	*10.5*	*8.8*	*0.0*	*30.6*
Caa, Ca, C		18.7		45.9
CCC		*21.9*		*51.9*

Note: Downgrades include defaults. Downgrade rates are calculated using estimates of mid-period denominators, denominators, constructed by subtracting half of the number of ratings withdrawn (over the whole period) from the number of rated issuers at the beginning of the period. Five-year downgrade rates are for annual cohorts from January 1981 to January 1994.

Table 9
Downgrade Rates (%) by Initial Moody's and Standard and Poor's Credit Rating: US vs. Non-US Firms (1981-1998)

	One-Year Horizon		Five-Year Horizon	
Credit Rating	US Firms	Non-US Firms	US Firms	Non-US Firms
(Moody's) Aaa	11.1	12.4	34.0	45.8
(S&P) AAA	*7.1*	*10.5*	*28.8*	*35.8*
Aa	10.6	9.6	38.6	36.7
AA	*7.4*	*7.6*	*30.1*	*33.1*
A	6.5	6.8	21.4	17.7
A	*5.9*	*5.7*	*21.3*	*19.8*
Baa	6.3	8.4	15.3	11.6
BBB	*5.9*	*7.4*	*16.3*	*14.5*
Ba	9.9	10.9	30.5	18.8
BB	*9.7*	*7.6*	*26.6*	*9.4*
B	9.7	6.8	35.3	28.9
B	*8.8*	*14.9*	*30.9*	*9.6*
Caa, Ca, C	18.9	15.2	47.1	15.4
CCC	*21.8*	*40.0*	*51.9*	*66.7*

Note: Downgrades include defaults. Downgrade rates are calculated using estimates of mid-period denominators, denominators, constructed by subtracting half of the number of ratings withdrawn (over the whole period) from the number of rated issuers at the beginning of the period. Five-year downgrade rates are for annual cohorts from January 1981 to January 1994.

Table 10
Downgrade Rates (%) by Initial Moody's and Standard and Poor's Credit Rating: US Bank vs. US Non-Financial Firms (1981-1998)

	One-Year Horizon		Five-Year Horizon	
Credit Rating	US Banks	US Non-Financials	US Banks	US Non-Financials
(Moody's) Aaa	27.6	10.6	77.6	32.1
(S&P) AAA	*14.4*	*7.5*	*46.9*	*30.6*
Aa	15.0	10.1	66.8	35.8
AA	*10.8*	*6.8*	*44.2*	*27.9*
A	6.5	6.6	22.9	21.9
A	*4.2*	*6.2*	*17.4*	*22.3*
Baa	8.5	6.3	15.7	15.9
BBB	*5.5*	*5.9*	*17.5*	*16.4*
Ba	13.7	9.8	38.9	30.9
BB	*10.7*	*9.5*	*27.2*	*26.5*
B	23.6	9.1	50.0	34.7
B	*19.4*	*8.4*	*41.1*	*30.3*
Caa, Ca, C	56.4	16.8	72.7	44.2
CCC	*21.1*	*21.1*	*50.0*	*52.4*

Note: Downgrades include defaults. Downgrade rates are calculated using estimates of mid-period denominators, denominators, constructed by subtracting half of the number of ratings withdrawn (over the whole period) from the number of rated issuers at the beginning of the period. Five-year downgrade rates are for annual cohorts from January 1981 to January 1994.

Table 11 **Average Implied Sectoral Differences in One-Year Downgrade Rates** **Percent, Relative to US Non-Financial Firms, from Probit Estimates**						
Variables Controlled for in Estimation	Moody's Rating (Alphanumeric); Year Dummies			Standard & Poor's Rating (Letter Grade only); Year Dummies		
Sample Period	1983-1998			1981-1998		
US sectors have same expected default rates	Restricted	Restricted	No	Restricted	Restricted	No
US & non-US firms have same expected default rates	Restricted	No	No	Restricted	No	No
Average Implied Difference Over All Rating Levels: (t-statistic for sector parameter in parentheses)						
US Banks			**3.90** **(6.10)**			0.93 (1.73)
Other US Financial Firms			0.73 (1.60)			0.38 (0.63)
All Non-US Firms		**2.66** **(6.78)**	**3.10** **(7.64)**		**2.40** **(5.62)**	**2.52** **(5.81)**
Sovereign Governments	-1.65 (-1.43)	-0.69 (-0.59)	-0.29 (-0.26)	**-2.76** **(-2.44)**	**-2.28** **(-2.04)**	-2.18 (-1.94)

Note: Differences in **bold** are statistically significant with 95% confidence. See Appendix Table A2 for estimated coefficients.

Appendix: Table A1 Probit Model Estimates for One-Year Default Rates				
	Moody's (1983-1998)		S&P (1981-1998)	
Intercept	-4.08 (0.21)	-4.12 (0.20)	-3.51 (0.14)	-3.54 (0.14)
1981 Dummy			-0.64 (0.28)	-0.64 (0.28)
1982 Dummy			0.20 (0.13)	0.20 (0.13)
1983 Dummy	0.21 (0.16)	0.21 (0.16)	-0.07 (0.15)	-0.07 (0.15)
1984 Dummy	0.32 (0.15)	0.32 (0.15)	-0.04 (0.14)	-0.04 (0.14)
1985 Dummy	0.30 (0.14)	0.29 (0.14)	0.05 (0.13)	0.05 (0.13)
1986 Dummy	0.57 (0.11)	0.57 (0.11)	0.28 (0.11)	0.29 (0.11)
1987 Dummy	0.36 (0.11)	0.36 (0.11)	-0.30 (0.13)	-0.29 (0.13)
1988 Dummy	0.23 (0.11)	0.21 (0.11)	-0.03 (0.11)	-0.03 (0.11)
1989 Dummy	0.57 (0.10)	0.56 (0.10)	0.05 (0.11)	0.05 (0.10)
1990 Dummy	0.74 (0.10)	0.72 (0.09)	0.36 (0.10)	0.36 (0.10)
1991 Dummy	0.71 (0.10)	0.69 (0.10)	0.45 (0.10)	0.45 (0.10)
1992 Dummy	0.22 (0.12)	0.20 (0.12)	0.10 (0.12)	0.10 (0.11)
1993 Dummy	0.14 (0.13)	0.13 (0.12)	-0.34 (0.15)	-0.34 (0.15)
1994 Dummy	-0.19 (0.13)	-0.20 (0.13)	-0.26 (0.13)	-0.26 (0.13)
1995 Dummy	0.03 (0.10)	0.03 (0.10)	-0.01 (0.11)	-0.00 (0.09)
1996 Dummy	-0.39 (0.13)	-0.39 (0.13)	-0.34 (0.13)	-0.33 (0.13)
1997 Dummy	-0.28 (0.12)	-0.28 (0.12)	-0.20 (0.12)	-0.20 (0.11)
Baa1 Dummy	0.40 (0.35)	0.40 (0.35)	0.65 (0.14)	0.66 (0.14)
Baa2 Dummy	0.63 (0.28)	0.64 (0.28)		
Baa3 Dummy	1.06 (0.24)	1.07 (0.24)		
Ba1 Dummy	1.28 (0.22)	1.28 (0.21)	1.16 (0.13)	1.18 (0.13)
Ba2 Dummy	1.25 (0.22)	1.27 (0.22)		
Ba3 Dummy	1.80 (0.20)	1.83 (0.20)		
B1 Dummy	2.02 (0.20)	2.05 (0.20)	1.86 (0.12)	1.88 (0.12)
B2 Dummy	2.37 (0.20)	2.40 (0.20)		
B3 Dummy	2.70 (0.20)	2.73 (0.20)		
Caa-C Dummy	3.14 (0.21)	3.16 (0.20)	2.70 (0.13)	2.72 (0.13)
Non-US Firm Dummy	0.04 (0.10)	0.05 (0.09)	0.06 (0.10)	0.07 (0.10)
US Bank Dummy		0.25 (0.11)		0.03 (0.12)
Non-Bank Financial US Firm Dummy		0.12 (0.09)		0.23 (0.11)

Notes: Standard errors in parentheses. The cumulative normal density function applied to the intercept gives the fitted probability that a US non-financial firm rated higher than Baa1 at the beginning of 1998 defaulted by the end of that year. For other fitted default probabilities, add any appropriate dummy variable coefficient(s) to the intercept before applying the normal cdf. For S&P samples, there is only one dummy per rating letter grade (i.e. BBB, BB, B, and CCC-C). We omit dummies above Baa1 because near-term defaults are very rare at high rating levels.

Appendix: Table A2 Probit Model Estimates for One-Year Downgrade Rates						
	Moody's (1983-1998)			S&P (1981-1998)		
Intercept	-1.09 (0.05)	-1.22 (0.05)	-1.25 (0.05)	-1.42 (0.05)	-1.50 (0.04)	-1.51 (0.05)
1981 Dummy				0.20 (0.05)	0.25 (0.06)	0.26 (0.06)
1982 Dummy				0.18 (0.06)	0.23 (0.06)	0.23 (0.06)
1983 Dummy	-0.15 (0.06)	-0.08 (0.06)	-0.07 (0.06)	0.03 (0.06)	0.08 (0.06)	0.08 (0.06)
1984 Dummy	-0.17 (0.06)	-0.10 (0.06)	-0.09 (0.06)	-0.01 (0.05)	0.03 (0.06)	0.04 (0.06)
1985 Dummy	-0.02 (0.06)	0.05 (0.05)	0.06 (0.05)	0.16 (0.05)	0.20 (0.05)	0.21 (0.05)
1986 Dummy	0.05 (0.05)	0.11 (0.05)	0.12 (0.05)	0.26 (0.05)	0.31 (0.05)	0.31 (0.05)
1987 Dummy	-0.16 (0.05)	-0.10 (0.05)	-0.11 (0.05)	-0.06 (0.05)	-0.02 (0.06)	-0.02 (0.06)
1988 Dummy	-0.11 (0.05)	-0.05 (0.05)	-0.05 (0.05)	0.07 (0.05)	0.12 (0.05)	0.12 (0.05)
1989 Dummy	-0.02 (0.05)	0.03 (0.05)	0.03 (0.05)	0.07 (0.05)	0.12 (0.05)	0.12 (0.05)
1990 Dummy	0.08 (0.05)	0.13 (0.04)	0.13 (0.05)	0.21 (0.05)	0.25 (0.05)	0.25 (0.05)
1991 Dummy	0.03 (0.05)	0.08 (0.04)	0.07 (0.05)	0.15 (0.05)	0.19 (0.05)	0.19 (0.05)
1992 Dummy	-0.03 (0.06)	0.01 (0.04)	0.01 (0.05)	-0.01 (0.05)	0.02 (0.05)	0.02 (0.06)
1993 Dummy	-0.19 (0.05)	-0.16 (0.05)	-0.16 (0.05)	-0.16 (0.05)	-0.13 (0.05)	-0.13 (0.05)
1994 Dummy	-0.51 (0.06)	-0.49 (0.05)	-0.49 (0.05)	-0.20 (0.05)	-0.18 (0.05)	-0.18 (0.05)
1995 Dummy	-0.36 (0.05)	-0.34 (0.05)	-0.34 (0.05)	-0.19 (0.05)	-0.17 (0.05)	-0.17 (0.05)
1996 Dummy	-0.52 (0.05)	-0.51 (0.05)	-0.50 (0.05)	-0.36 (0.05)	-0.34 (0.05)	-0.34 (0.05)
1997 Dummy	-0.36 (0.05)	-0.35 (0.04)	-0.35 (0.05)	-0.19 (0.05)	-0.18 (0.05)	-0.18 (0.05)
Aa1 Dummy	-0.80 (0.09)	-0.80 (0.09)	-0.81 (0.09)	-0.02 (0.04)	-0.01 (0.03)	-0.01 (0.04)
Aa2 Dummy	-0.33 (0.06)	-0.32 (0.06)	-0.32 (0.06)			
Aa3 Dummy	0.23 (0.05)	0.26 (0.05)	0.25 (0.05)			
A1 Dummy	-0.81 (0.06)	-0.77 (0.06)	-0.78 (0.06)	-0.14 (0.04)	-0.12 (0.03)	-0.12 (0.04)
A2 Dummy	-0.42 (0.05)	-0.36 (0.05)	-0.37 (0.05)			
A3 Dummy	0.12 (0.05)	0.18 (0.05)	0.17 (0.05)			
Baa1 Dummy	-0.73 (0.07)	-0.66 (0.07)	-0.67 (0.07)	-0.12 (0.04)	-0.08 (0.04)	-0.08 (0.04)
Baa2 Dummy	-0.51 (0.06)	-0.44 (0.06)	-0.44 (0.06)			
Baa3 Dummy	0.11 (0.05)	0.18 (0.05)	0.19 (0.05)			
Ba1 Dummy	-0.48 (0.06)	-0.41 (0.06)	-0.41 (0.06)	0.12 (0.04)	0.16 (0.04)	0.16 (0.05)
Ba2 Dummy	-0.18 (0.06)	-0.11 (0.06)	-0.10 (0.06)			
Ba3 Dummy	0.15 (0.05)	0.23 (0.05)	0.25 (0.05)			
B1 Dummy	-0.43 (0.06)	-0.35 (0.06)	-0.33 (0.06)	0.06 (0.04)	0.11 (0.04)	0.11 (0.05)
B2 Dummy	-0.06 (0.06)	0.03 (0.06)	0.05 (0.06)			
B3 Dummy	0.34 (0.06)	0.43 (0.06)	0.45 (0.06)			
Caa-C Dummy	0.40 (0.08)	0.50 (0.08)	0.51 (0.08)	0.61 (0.07)	0.66 (0.07)	0.66 (0.07)
Non-US Sovereign Dummy	-0.13 (0.09)	-0.05 (0.09)	-0.02 (0.09)	-0.24 (0.10)	-0.20 (0.10)	-0.19 (0.10)
Non-US Firm Dummy		0.18 (0.03)	0.21 (0.03)		0.16 (0.03)	0.17 (0.03)
US Bank Dummy			0.26 (0.04)			0.07 (0.04)
Non-Bank Financial US Firm Dummy			0.05 (0.03)			0.03 (0.04)

Notes: Standard errors in parentheses. For fitted downgrade probabilities, add any appropriate dummy variable coefficient(s) to the intercept and apply the normal cdf. For S&P samples, there is only one dummy per rating letter grade (i.e. AA, A, BBB, BB, B, and CCC-C).

Section III.D. Rating Differences across Agencies

Introduction

A major issue raised by the extensive use of ratings by regulatory authorities is the degree to which ratings may differ across agencies. If the correspondence of particular letter-grades to default and/or expected loss differs significantly across agencies, that could have serious implications for the consistency and optimality of regulatory rules that rely on ratings. In particular, unless higher ratings were discounted in the event of split ratings, the ratings of the more lenient agencies would be the ones that counted when multiple ratings were obtained. In addition, as has been noted elsewhere (for example, Cantor and Packer, 1994), borrowers may be encouraged to shop for favourable ratings, and agencies to shade their ratings for competitive reasons.

The incentives of rating agencies to be lenient should be at least somewhat mitigated by the long-term damage to their reputations that giving consistently easy ratings would entail. Ultimately, the degree to which reputation may act as a constraint on ratings differences is an empirical issue.

Mean Ratings Differences

One of the first academic papers to collate data on ratings differences of many agencies was that of Beattie and Searle (1992a). Utilising a large sample of long-term credit ratings reported by twelve of the leading international rating agencies and recorded in the 1990 publication of *Credit Ratings International*, they found more than 5,000 cases where a pair of rating agencies had ratings outstanding for the same borrower. Less than one-half of the ratings pairs agreed precisely, and more than 20% differed by two notches or more. (One "rating notch" is, for example, the difference between an A and A+ rating; two ratings notches the difference between A and AA-).

Of course, differences of opinion among agencies are to be expected. Alternative rating methodologies may coexist among agencies, as can different subjective judgements regarding qualitative risk factors. The key question is to what degree the observed differentials reflect systematic differences in the ratings scales of agencies. Beattie and Searle address this question by computing the mean ratings differences across jointly rated companies for every possible pair of rating agencies.

The agency pair with the largest number of jointly rated companies is that of Moody's Investors Service and Standard & Poor's, the two largest rating agencies. The average difference in their ratings for the 1,398 jointly rated companies was only five-one-hundredths of a notch, suggesting that they assign very similar average ratings. The rough equivalence in the ratings on jointly rated issues of Moody's and S&P's has been noted in many other papers as well (Perry, 1985; Ederington, 1986; Ederington and Yawitz, 1987; Cantor and Packer 1994, 1995, 1997a; Jewell and Livingston, 1998).

However, the rough equivalence in rating scales does not necessarily extend to other rating agencies. For example, when the ratings of eight other rating agencies are compared to those given by Moody's to the same borrowers, the ratings of five others were significantly higher than Moody's. The ratings of the third and fourth largest US agencies each rated about a third

of a notch higher than Moody's, and two of the Japanese rating agencies rated on average between one to two notches higher than Moody's.

Sectoral Patterns in Mean Ratings Differences

In exercises similar to those performed by Beattie and Searle, Cantor and Packer (1994) examined the initial ratings by the four largest US agencies of speculative-grade (or "junk") bonds issued between 1989 and 1993. While they found the ratings of Moody's and S&P to be nearly identical on average, they found the third and fourth largest agencies to disagree with Moody's with greater regularity and on a greater scale in the junk-bond sample than in the aforementioned sample of Beattie and Searle. The ratings of the smaller agencies were between one and one-and-a-half rating notches higher than those of Moody's and S&P.

Cantor and Packer (1994) also compared the international bank ratings of nine other rating agencies with those of Moody's. As with the junk-bond sample, ratings agreement was less frequent and ratings differentials higher for banks than for the universe of ratings examined by Beattie and Searle. Notably, the three Japanese agencies rated banks two to three notches higher on average than the US agencies.

Frequency of Higher and Lower Ratings

Other statistics support the view that there is some difference in rating scales between the larger and smaller agencies. One study of ratings of US issuers from 1989 to 1993 found that bond ratings from the smaller rating agencies were much more likely to be higher than lower than those of Moody's and S&P (Cantor and Packer, 1994). For example, Fitch rated higher than Moody's 58% of the time and higher than S&P 50% of the time. Fitch ratings were lower than Moody's only about 6% of the time and lower than S&P 7% of the time. A similar pattern arose when comparing DCR (Duff & Phelps) ratings with Moody's and S&P, as illustrated by Table 1.

By contrast, measures of correlation between the ratings of each of the largest two agencies and the other US agencies are about as high as the rank correlation between the two large agencies themselves. This result suggests that differences in agency ratings as measures of absolute risk do not imply differences in ratings as measures of relative risk.

Table 1: Rating differences between agencies

	Distribution of DCR's ratings relative to:		Distribution of Fitch's ratings relative to:	
	Moody's	Standard and Poor's	Moody's	Standard and Poor's
Percent rated higher	49.7	43.2	58.7	49.7
Percent rated same	39.6	44	35.5	43.2
Percent rated lower	10.7	12.8	5.8	7.1
Average difference in rating notches	0.60	0.46	0.74	0.56

Note: The table compares 363 firms rated jointly by Moody's, Standard and Poor's, and DCR, and 157 firms rated jointly by Moody's, S&P, and Fitch at year-end 1993. Source: Cantor and Packer (1997a)

Sample Selection Bias

One possible pitfall of simple comparisons of average rating levels (or of the observed frequency of higher or lower ratings) arises from differences in ratings policies of the rating agencies. Moody's and S&P rate all taxable corporate bonds publicly issued in the United States, regardless of whether a rating has been solicited by the issuer. Both Moody's and S&P also frequently issue unsolicited ratings to issuers from outside the United States as well (although S&P marks those ratings with a "pi", which denotes that the rating is based entirely on public information).

Most of the other rating agencies in the United States have a longstanding policy of rating bonds only on the request of the issuer, which involves a fee being paid for the ratings. It is possible that the smaller agencies' ratings are only purchased (and thus reported) when there is a strong expectation of improvement upon Moody's and S&P ratings, while when the smaller agencies might, in fact, rate lower, their ratings are not purchased. This implies a potential bias in the mean rating and in the frequency comparisons, which is known in the econometric literature as sample selection bias.

Cantor and Packer (1997a) control for the existence of potential sample selection bias using an approach pioneered by Heckman (1979). They find limited evidence for significant sample selection bias and thus much stronger evidence for differences in ratings scales. While sample selection bias may explain some pair-wise ratings differentials, most is attributable to ratings scale differentials.

Impact of Third Ratings

In the case of split ratings by Moody's and S&P, both ratings affect bond yields, and the best forecast of yields is obtained when yields are inferred from the average of the two ratings (Cantor and Packer, 1997b). Other work suggests that the third rating can often serve as a tiebreaker when Moody's and S&P disagree. In the US, the Securities Valuation Office (SVO) of the National Association of Insurance Commissioners (NAIC), conducts its own analysis to determine a quality category for capital charge purposes when rating agencies ratings are split across quality categories. Analysis of a sample of 305 split rated bonds as of year-end 1994

indicates that the ratings of all the four largest agencies correlated with the SVO's determinations. In particular, when Moody's and S&P disagree, the SVO is much more likely to assign the higher quality category when a higher third rating has been assigned than when no third rating is assigned (Cantor and Packer, 1996).

Reinebach (1998) reports the results of a study by Jewell and Livingston. The authors analysed the behaviour of 235 bonds rated by Fitch, Moody's, and S&P between January 1991 and March 1995, and found that for corporate bonds similarly rated by Moody's and S&P, a higher Fitch rating resulted in a lower spread. The yield differential widened in cases where the Moody's and S&P ratings differed and the Fitch rating coincided with the higher of the two. Regardless of ratings differences, the market appears to reward issuers with a lower yield when a third rating is assigned, especially when the rating is higher.

Comparing the Ratings of US and Non-US Agencies

Most historical credit rating and default data pertain to ratings of US entities assigned by Moody's and S&P, agencies headquartered in the United States. Nevertheless, in recent years, both agencies have dramatically expanded their overseas operations. The degree to which the overseas ratings of established US agencies differ from local rating agencies is of interest. There is ample room for varying interpretations of distinctive business practices, accounting and legal systems, when assessing the risks of issuers in different countries.

Outside of the United States, Japanese rating agencies are among the oldest and most active. Data availability has thus attracted the attention of researchers. Numerous authors have documented that Japanese rating agencies consistently give higher ratings to the same bond issues than do Moody's and S&P (e.g. Hirai and Tomita, 1996; Watanabe, 1996; Packer and Reynolds, 1997). A table from one of these articles is presented here as Table 2. It compares the US and Japanese credit ratings of 60 samurai bond issuers during 1995 and 1996, and 236 Japanese issuers in the domestic bond market on November 1, 1996. Samurai bonds are yen-denominated bonds issued in Japan by non-Japanese obligors. Bonds are broken into two additional categories, investment-grade and non-investment grade.

Table 2: Rating Differentials between Japanese and US Agencies

	Samurai Issuers		Domestic Issuers	
Grade	Number of Jointly Rated Issues	Average Notch Differential	Number of Jointly Rated Issues	Average Notch Differential
Investment	46	+2.4	197	+2.6
Non-investment	14	+2.5	39	+4.8

Sources: Packer and Reynolds (1997). Based on ratings from Moody's, Standard and Poor's, Nippon Investors Service, the Japan Bond Rating Institute, and the Japan Credit Rating Agency.

The evidence from Table 2 suggests that Japanese ratings are consistently higher than the US ratings, approximately 2.5 notches higher for all categories except speculative-grade domestic issues, which are 4.8 notches higher. Since nearly all borrowers in the Japanese market have

at least one Japanese agency rating, sample selection bias is an extremely unlikely explanation for these consistently large rating differentials.

Because the intersection across agencies of rated issuers is relatively small, the table above by itself cannot resolve the question of whether Japanese rating scales are more lenient than US agency scales, or whether US agencies rate Japanese corporations with a tougher scale than they rate US corporations. However, further insight can be obtained from the correspondence between ratings and subsequent defaults. Some preliminary evidence on this front is available from JCIF (1999). This analysis suggests that the Japanese ratings of Moody's Investors Service may be relatively tough, since fewer defaults have been observed over time in Japan than would have been predicted by Moody's low ratings (given Moody's US default experience), despite Japan's stagnant economic conditions in the 1990s. However, the JCIF sample is too small to establish statistical significance.

Conclusion

In summary, the literature finds clear evidence of differences in ratings scales once we move beyond the two largest agencies. Some of these differences might be explained by sample selection bias (deriving from the fact that Moody's and S&P rate almost all issuers in the United States while other agencies rate only upon request). However, the one study that empirically investigates the influence of sample selection bias found that most of the rating differences could not be explained by sample selection bias. Yet, differences in rating scales notwithstanding, the market appears to value the additional information offered by additional ratings, with reduced spreads on issues with multiple ratings. In addition, the rank correlations between ratings of each of the largest two agencies and other US agencies are about as high as the rank correlations between the two large agencies themselves. This result suggests that the agencies are likely to be in agreement over the relative risk of borrowers.

Because they are among the oldest and most active of rating agencies outside of the United States, Japanese rating agencies have attracted the attention of researchers. Large rating differences are apparent between Japanese rating agencies and non-Japanese rating agencies that tend to rate Japanese credits lower. It is unlikely that sample selection bias is a major determinant of these large rating differentials. However, it is also not clear whether Japanese rating agencies have rated domestic credits using a higher rating scale than that used by Moody's and S&P, or whether US rating agencies have rated Japanese credits using a tougher rating scale compared to credits in the United States. (The two explanations are not mutually exclusive.) The relatively low default rates on Japanese credits given speculative-grade ratings by Moody's lends some credence to the latter view, though the history of rated issuers is still too short to reach any definitive conclusion.

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