Prototype risk rating system

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Abstract

This paper explores the traditional and prevalent approach to credit risk assessment – the rating system. We first describe the rating systems of the two main credit rating agencies, Standard & Poor's and Moody's. Then we show how an internal rating system in a bank can be organized in order to rate creditors systematically. We suggest adopting a two-tier rating system. First, an obligor rating that can be easily mapped to a default probability bucket. Second, a facility rating that determines the loss parameters in case of default, such as (i) "loss given default" (LGD), which depends on the seniority of the facility and the quality of the gurantees, and (ii) "usage given default" (UGD) for loan commitments, which depends on the nature of the commitment and the rating history of the borrower. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

In this paper we explore the traditional and prevalent approach to credit risk assessment – the rating system. Most rating systems are based on both quantitative and qualitative evaluation. The final decision is based on many

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different attributes, but usually it is not calculated using a formal model that would show how to weight all these attributes in a normative way. In essence, the systems are based on general considerations and on experience, and not on mathematical modeling. They cannot therefore be regarded as precise, and they also clearly rely on the judgement of the ratings evaluators.

Ratings systems are usually applied to non-financial corporations, as special approaches are employed for banks and other financial institutions. First of all, we describe the rating systems of the two main credit rating agencies, Standard & Poor's (S&P) and Moody's. Almost all public issues of debt instruments in the US and Canada are rated by these agencies. Their ratings of public issues are made available to the public, as are the periodic revisions of these ratings. Companies and instruments are classified into discrete rating categories that correspond to the expected loss, i.e. the combined estimate of the likelihood of the company failing to pay its obligations and the loss in the event of default.

In Section 3, we show how an internal rating system in a bank can be organized in order to rate creditors systematically. Ratings generally apply to obligors and loans for which underwriting and structuring require judgement. They are produced for business and institutional loans and counterparties on derivatives transactions, not for consumer loans. Credit decisions for small lending exposures are primarily based on credit scoring techniques. While the system we propose in this paper is based on the extensive experience of a commercial bank, other banks may have somewhat different systems, but most are of a similar nature. In Sections 5–7 the details of the rating process and considerations are described.

We suggest adopting a two-tier rating system. First, an *obligor rating* (OR) that can be easily mapped to a default probability bucket. Second, a *facility rating* (FR) that determines the loss parameters in case of default, such as (i) "loss given default" (LGD), which depends on the seniority of the facility and the quality of the guarantees, and (ii) "usage given default" (UGD) for loan commitments, which depends on the nature of the commitment and the rating history of the borrower.

The main problem faced by banks is obtaining information about companies that have not issued traded debt instruments. The data about these companies are of unproven quality and are therefore less reliable, and it can be a challenge to extract the minimum required information in order to improve the allocation of credit.

The credit analysts in a bank or a rating agency must take into consideration many attributes of a firm: financial as well as managerial, quantitative as well as qualitative. The analysts must ascertain the financial health of the firm, and determine if earnings and cashflows are sufficient to cover the debt obligations. The analysts would also want to analyze the quality of the assets of the firm and the liquidity position of the firm.
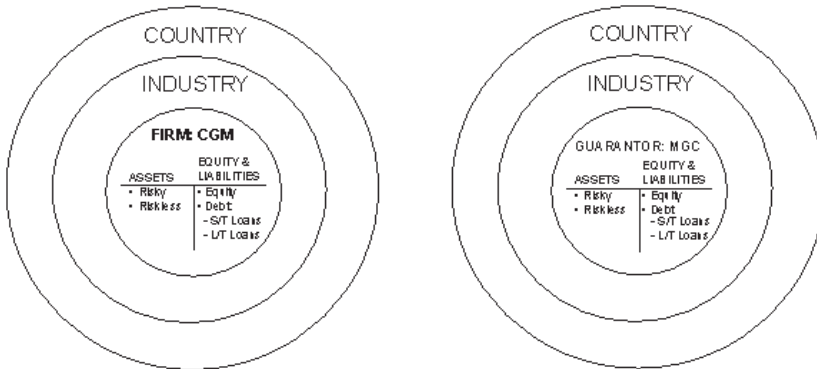
Fig. 1. The environment of the borrower.

In addition, the analysts must take into account the features of the industry to which the potential client belongs, and the status of the client within its industry. The effects of macro-economic events on the firm and its industry should also be considered, as well as the country risk of the borrower. Combined industry and country factors can be assessed to calculate the correlation between assets for the purpose of calculating portfolio effects.

In a very schematic way, Fig. 1 illustrates the environment of the borrower that the credit analyst must assess in order to determine the creditworthiness of the borrower and thus the interest spread that the bank should charge. A major consideration in providing a loan is the existence of a collateral, or otherwise of a loan guarantor, and the quality of the guarantee. This issue of guarantee is especially important for banks providing loans to small and medium-sized companies that cannot offer sufficient collateral.

When rating a borrower one must decide whether to grade borrowers according to their current conditions (''point-in-time'' rating assessment), or their expected creditworthiness over the life of the loan or the entire credit cycle (''through-the-cycle'' rating assessment). This decision depends on the objective of the rating system. [1] A long-horizon, through-the-cycle approach is used when the purpose of the rating system is to assist in lending or investment decisions. Loan officers generally consider potential stress conditions in the lending decision and in structuring a transaction (covenants, loan amount, term, collateral, guarantee) over the life of the loan. This is the philosophy adopted by rating agencies. It involves estimating the borrower's condition at the worst point in a credit cycle, and grading according to the risk at that time. It is therefore expected that agencies' ratings stay stable over the credit cycle,

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[1] See Treacy and Carey (2000).

and to be adjusted only when the borrower experiences a major shock that affects its long-term condition.

Conversely, when the objective is to allocate economic capital, monitor loans and establish loan reserves, the point-in-time approach is more appropriate. The credit horizon for these decisions is usually one year, and the rating decision is based on the borrower's current and most likely future outlook over the credit horizon. Point-in-time rating is more responsive to change in the credit status of the obligor, and therefore more appropriate to monitor a credit. At the same time, point-in-time ratings are supposed to be updated frequently to stay current. This approach is also consistent with the use of ratings as an input to a credit model, such as CreditMetrics[TM], based on the credit migration methodology. Credit risk models require specifying the credit horizon, usually one year, and each rating is mapped to a default probability bucket.

2. Rating agencies

2.1. The external agency rating process

The issuance of bonds by corporations is a 20th-century phenomenon. It started at the beginning of the century, at approximately the same time that the first papers and articles were published on the analysis of accounting ratios, as a means of diagnosing the financial strength of a company. By the 1920s, this approach had been commercialized and specialized firms were offering their services, and promoting the merits of ratio analysis. This was also the period when Moody's (1909), S&P (1916), and other agencies started to rate public debt issues. Over the last 30 years, the introduction of new financial products has led to the development of new methodologies and criteria for credit rating: S&P was the first rating company to rate mortgage-backed bonds (1975), mutual funds (1983) and asset-backed securities (1985).

A credit rating is not, in general, an investment recommendation concerning a given security. In the words of S&P, "A credit rating is S&P's opinion of the general creditworthiness of an obligor, or the creditworthiness of an obligor with respect to a particular debt security or other financial obligation, based on relevant risk factors." [2] A rating in Moody's words is "...an opinion on the future ability and legal obligation of an issuer to make timely payments of principal and interest on a specific fixed income security." [3] "Moody's ratings of industrial and financial companies have primarily reflected default probability, while expected severity of loss in the event of default has played an

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[2] S&P Corporate Ratings Criteria, 1998, p. 3.
[3] Moody's Credit Ratings and Research, 1998, p. 4.

important secondary role. In the speculative-grade portion of the market, which has been developing into a distinct sector, Moody's ratings place more emphasis on expected loss than on relative default risk." [4]

Since S&P and Moody's are considered to have expertise in credit rating and are regarded as unbiased evaluators, their ratings are widely accepted by market participants and regulatory agencies. Financial institutions, when required to hold investment-grade bonds by their regulators, use the ratings of credit agencies such as S&P and Moody's to determine which bonds are of investment grade.

The subject of a credit rating might be a company issuing debt obligations. In the case of such "issuer credit ratings", the rating is an opinion on the obligor's overall capacity to meet its financial obligations. The opinion is not specific to any particular liability of the company, nor does it consider the merits of having guarantors for some of the obligations. In the issuer credit rating category are counterparty ratings, corporate credit ratings, and sovereign credit ratings.

Another class of rating is "issue-specific credit ratings". In this case, the rating agency makes a distinction, in its rating system and symbols, between long-term and short-term credits. The short-term ratings apply to commercial paper (CP), certificates of deposits (CD) and put bonds. [5] In rating a specific issue the attributes of the issuer, as well as the specific terms of the issue, the quality of the collateral and the creditworthiness of the guarantors, are taken into account.

The rating process includes quantitative, qualitative and legal analyses. The quantitative analysis is mainly financial analysis and is based on the firm's financial reports. The qualitative analysis is concerned with the quality of management, and includes a thorough review of the firm's competitiveness within its industry as well as the expected growth of the industry and its vulnerability to technological changes, regulatory changes and labor relations.

Fig. 2 illustrates the process of rating an industrial company. The process works through sovereign and macro-economic issues, industry outlook and regulatory trends, to specific attributes (including quality of management, operating and financial positions) and eventually to the issue-specific structure of the financial instrument.

When rating a company, the nature of competition within its industry is a very important consideration. In trying to illustrate its evaluation process, S&P

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[4] Moody's Investors Service, Rating Methodology: The Evolving Meaning of Moody's Bond Ratings, 1999, p. 4.

[5] A put bond is a bond stipulation that allows the holder to redeem the bond at face value at a specific, predetermined time so that if interest rates go up the holder can avoid losing money as long as the stipulation is operative; or in other words, it's a bond giving the investor the right to liquidate the bond, or to sell it back to the issuing party.
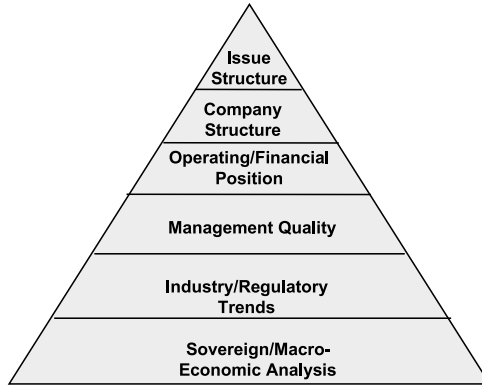
Fig. 2. Moody's rating analysis of an industrial company.

uses an example of a firm from the airline industry. For such a firm, the analysis concentrates on issues such as market position in specific markets locally and internationally, including barriers to entry, revenue generation (including pricing, utilization of capacity, service reputation, and productivity), cost control (for labor, fuel, commissions) and the quality of the aircraft fleet.

The assessment of management, although subjective in nature, investigates how likely it is that it will achieve operational success, and its risk tolerance. The rating process includes meetings with the management of the issuer to review operating and financial plans, policies and strategies. All the information is reviewed and discussed by a rating committee with appropriate expertise in the relevant industry, which then votes on the recommendation. The issuer can appeal against the rating before it is made public by supplying new information. The rating decision is usually issued four to six weeks after the agency is asked to rate a debt issue.

Usually the ratings are reviewed once a year, based on new financial reports, new business information and review meetings with management. A "credit watch" or "rating review" notice is issued if there is reason to believe that the review may lead to a credit rating change. A change of rating has to be approved by the rating committee. The rating process of S&P is described in Fig. 3. (An almost identical process is used by all rating agencies.)

2.2. Credit ratings by S&P and Moody's

S&P is one of the major rating agencies in the world, operating in more than 50 countries. Moody's operates mainly in the US but has many branches internationally. Moody's, together with S&P, has a dominant position to such an
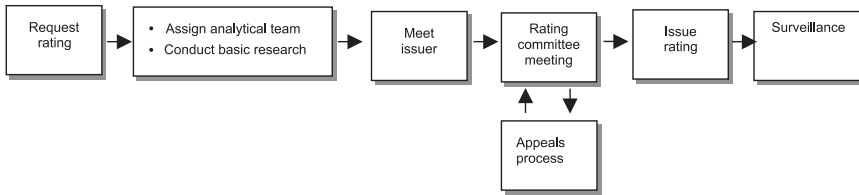
Fig. 3. Standard & Poor's debt rating process.

extent that US. Justice Department inquiries have alleged that there may be "anti-competitive practices" in the bond rating industry. [6]

Tables 1 and 2 provide the definitions of the ratings categories of S&P and Moody's for long-term credit. We also show in Table 3(a) and (b) the short-term ratings of S&P and Moody's, respectively. If we focus on S&P (Table 1), we can see that the symbols are identical for issue and issuer credit ratings, and also that the definitions closely correspond to one another. The categories are defined in terms of default risk and the likelihood of payment for the issuer. Issues rated in the four highest categories (i.e., AAA, AA, A and BBB of S&P and Aaa, Aa, A and Baa of Moody's) are generally considered as being of investment grade. Some financial institutions, for special or approved investment programs, are required to invest only in bonds or debt instruments that are of investment grade. Obligations rated BB, B, CCC, CC, and C (Ba, B, Caa, Ca and C of Moody's), are regarded as having significant speculative characteristics. BB (Ba of Moody's) is the least risky and C is the most risky.

As can be seen in Tables 1 and 2, the rating categories used by S&P and Moody's are quite similar, though differences of opinion can lead in some case to different ratings of specific debt obligations. Moody's applies numerical modifiers 1, 2, and 3 in each generic rating classification from Aa through Caa. The modifier 1 indicates that the obligation ranks in the higher end of its generic rating category; the modifier 2 indicates a mid-range ranking; and the modifier 3 indicates a ranking at the lower end of that generic rating category. For e.g., B1 in Moody's rating system has an equivalent ranking to B+ in S&P's rating system.

Moody's short-term debt ratings employ three designations only, all judged to be investment grade (Table 3(b)).

2.3. The differences in ratings

While the rating agencies use similar methods and approaches to rate debt, they sometimes come up with different ratings of the same debt investment. In

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[6] See Nusbaum (1996).

Table 1
S&P ratings category definitions[a]

AAA	An obligation rated AAA has the highest rating assigned by Standard & Poor's. The obligor's capacity to meet its financial commitment on the obligation is extremely strong
AA	An obligation rated AA differs from the highest rated obligations only in small degree. The obligor's capacity to meet its financial commitment on the obligation is very strong
A	An obligation rated A is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than obligations in higher rated categories. However, the obligor's capacity to meet its financial commitment on the obligation is still strong
BBB	An obligation rated BBB exhibits adequate protection parameters. However, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitment on the obligation
BB	An obligation rated BB is less vulnerable to nonpayment than other speculative issues. However, it faces major ongoing uncertainties or exposure to adverse business, financial, or economic conditions which could lead to the obligor's inadequate capacity to meet its financial commitment on the obligation
B	An obligation rated B is more vulnerable to nonpayment than obligations rated BB but the obligor currently has the capacity to meet its financial commitment on the obligation. Adverse business, financial, or economic conditions will likely impair the obligor's capacity or willingness to meet its financial commitment on the obligation
CCC	An obligation rated CCC is currently vulnerable to nonpayment, and is dependent upon favorable business, financial, and economic conditions for the obligor to meet its financial commitment on the obligation. In the event of adverse business, financial or economic conditions, the obligor is not likely to have the capacity to meet its financial commitment on the obligation
CC	An obligation rated CC is currently highly vulnerable to nonpayment.
C	The C rating may be used to cover a situation where a bankruptcy petition has been filed or similar action has been taken, but payments on this obligation are being continued
D	The D rating, unlike other ratings, is not prospective; rather, it is used only where a default has actually occurred – and not where a default is only expected. Standard & Poor's changes ratings to D either: On the day an interest and/or principal payment is due and is not paid. An exception is made if there is a grace period and S&P believes that a payment will be made, in which case the rating can be maintained; or Upon voluntary bankruptcy filing or similar action. An exception is made if S&P expects that debt service payments will continue to be made on a specific issue. In the absence of a payment default or bankruptcy filing, a technical default (i.e., covenant violation) is not sufficient for assigning a D rating
+ or −	The ratings from AA to CCC may be modified by the addition of a plus or minus sign to show relative standing within the major rating categories

Table 1 (Continued)

R	This symbol is attached to the ratings of instruments with significant noncredit risks. It highlights risks to principal or volatility of expected returns which are not addressed in the credit rating. Examples include: obligations linked or indexed to equities, currencies, or commodities; obligations exposed to severe prepayment risk – such as interest-only or principal-only mortgage securities; and obligations with unusually risky interest terms, such as inverse floaters

[a] *Source*: Reproduced from Corporate Ratings Criteria of S&P for 1998.

their studies of the credit rating industry Cantor and Packer (1995) show that for 1168 firms rated by both Moody's and S&P at the end of 1993, only 53% of the firms rated AA or Aa and AAA or Aaa was rated the same by both agencies. For other investment-grade issues only 36% were rated in the same way, while 41% of those rated as below investment grade had been awarded the same ratings.

Table 4 is from Cantor and Packer (1994). It shows the differences between the ratings of the two largest rating agencies, S&P and Moody's, and those of the next two agencies in terms of size and reputation, namely Duff & Phelps and Fitch. The table compares 298 firms rated by Moody's, S&P and Duff and Phelps and 161 firms rated jointly by Moody's, S&P and Fitch at year-end 1993. The two smaller agencies, Duff and Phelps as well as Fitch, tend to rate debt issues higher or the same as S&P and Moody's. In only 10% or less of the cases did they give a lower rating.

This issue of ratings differences is an important one. It raises two questions. First, to what extent is the rating quantitatively based and what is the role of judgement? (In Section 3.4, we discuss the measurement of default probabilities and recovery rates.) The second question concerns the independence of the rating agencies. Since the rated companies pay to be rated, there is a perceived danger that business pressures will affect the process.

3. Introduction to internal risk rating

In this section, we look at an internal risk rating system (RRS). A typical RRS will assign both an obligatory rating (OR) to each borrower (or group of borrowers), and a facility rating (FR) to each available facility. A risk rating (RR) is designed to depict the *risk of loss* [7] in a credit facility. A robust RRS

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[7] The risk of loss is a very general notion since it can be described in several distinct dimensions. For example, one can describe it in relation to the expected loss dimension, the unexpected loss (economic capital) dimension, the 10 bp tail probability of loss dimension, etc. One would need to describe risk of loss in a precise fashion in order to appropriately backtest the degree to which one's RRS was predictive.

Table 2
Moody's long-term debt ratings[a]

Aaa	Bonds which are rated Aaa are judged to be of the best quality. They carry the smallest degree of investment risk and are generally referred to as "gilt edged". Interest payments are protected by a large or by an exceptionally stable margin and principal is secure. While the various protective elements are likely to change, such changes as can be visualized are most unlikely to impair the fundamentally strong position of such issues
Aa	Bonds which are rated Aa are judged to be of high quality by all standards. Together with the Aaa group they comprise what are generally known as high-grade bonds. They are rated lower than the best bonds because margins of protection may not be as large as in Aaa securities or fluctuation of protective elements may be of greater amplitude or there may be other elements present which make the long-term risk appear somewhat larger than the Aaa securities
A	Bonds which are rated A possess many favorable investment attributes and are to be considered as upper medium-grade obligations. Factors giving security to principal and interest are considered adequate, but elements may be present which suggest a susceptibility to impairment some time in the future
Baa	Bonds which are rated Baa are considered as medium-grade obligations (i.e., they are neither highly protected nor poorly secured). Interest payments and principal security appear adequate for the present but certain protective elements may be lacking or may be characteristically unreliable over any great length of time. Such bonds lack outstanding investment characteristics and in fact have speculative characteristics as well
Ba	Bonds which are rated Ba are judged to have speculative elements; their future cannot be considered as well-assured. Often the protection of interest and principal payments may be very moderate, and thereby not well safeguarded during both good and bad times over the future. Uncertainty of position characterizes bonds in this class
B	Bonds which are rated B generally lack characteristics of the desirable investment. Assurance of interest and principal payments or of maintenance of other terms of the contract over any long period of time may be small
Caa	Bonds which are rated Caa are of poor standing. Such issues may be in default or there may be present elements of danger with respect to principal or interest
Ca	Bonds which are rated Ca represent obligations which are speculative in a high degree. Such issues are often in default or have other marked shortcomings
C	Bonds which are rated C are the lowest rated class of bonds, and issues so rated can be regarded as having extremely poor prospects of ever attaining any real investment standing

[a] *Source*: Moody's Investor Service (1995).

Table 3

(a) The short-term credit ratings of S&P[a]

A-1   A short-term obligation rated A-1 is rated in the highest category by S&P. The obligor's capacity to meet its financial commitment on the obligation is strong. Within this category, certain obligations are designated with a plus sign (+). This indicates that the obligor's capacity to meet its financial commitment on these obligations *is extremely strong*

A-2   A short-term obligation rated A-2 is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than obligations in higher rating categories. However, the obligor's capacity to meet its financial commitment on the obligation *is satisfactory*

A-3   A short-term obligation rated A-3 exhibits adequate protection parameters. However, adverse economic conditions or changing circumstances are more likely to lead to a *weakened capacity* of the obligor to meet its financial commitment on the obligation

B   A short-term obligation rated B is regarded as having significant speculative characteristics. The obligor currently has the capacity to meet its financial commitment on the obligation; however, it faces major ongoing uncertainties which could lead to the obligor's *inadequate capacity* to meet its financial commitment on the obligation

C   A short-term obligation rated C is *currently vulnerable to nonpayment* and is dependent upon favorable business, financial, and economic conditions for the obligor to meet its financial commitment on the obligation

D   The rating 'D' is given where a short-term debt has actually defaulted

(b) Moody's short-term debt ratings[b]

Prime 1   Issuers rated Prime-1 (or supporting institutions) have a superior ability for repayment of senior short-term debt obligations. Prime-1 repayment ability will often be evidenced by many of the following characteristics:
Leading market positions in well-established industries
High rates of return on funds employed
Conservative capitalization structure with moderate reliance on debt and ample asset protection
Broad margins in earnings coverage of fixed financial charges and high internal cash generation
Well-established access to a range of financial markets and assured sources of alternate liquidity

Prime 2   Issuers rated Prime-2 (or supporting institutions) have a strong ability for repayment of senior short-term debt obligations. This will normally be evidenced by many of the characteristics cited above but to a lesser degree. Earnings trends and coverage ratios, while sound, may be more subject to variation. Capitalization characteristics, while still appropriate, may be more affected by external conditions. Ample alternate liquidity is maintained

Prime 3   Issuers rated Prime-3 (or supporting institutions) have an acceptable ability for repayment of senior short-term obligations. The effect of industry characteristics and market compositions may be more pronounced. Variability in earnings and profit-ability may result in changes in the level of debt protection measurements and may require relatively high financial leverage. Adequate alternate liquidity is maintained

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[a] *Source*: Reproduced from Corporate Ratings Criteria of S&P for 1998.
[b] *Source*: Moody's Investor Service (1995).

Table 4
Credit rating differences between agencies[a]

	Distribution of Duff & Phelps ratings relative to		Distribution of Fitch's rating relative to	
	Moody's	S&P	Moody's	S&P
Rated higher (%)	47.6	39.9	55.3	46.6
Rated same (%)	42.3	46.5	37.9	43.5
Rated lower (%)	10.1	13.5	6.8	9.9
Average difference in matched rating	0.57	0.16	0.74	0.56

[a] *Source*: Cantor and Packer (1994), Federal Reserve Bank of New York.

should offer a carefully designed, structured and documented series of steps for the assessment of each rating.

3.1. Objectivity and methodology

The goal is to generate accurate and consistent RRs, yet also to allow professional judgment to significantly influence a rating where this is appropriate. The expected *loss* is the product of an exposure (say $100) and the *probability of default* (say 2%) of an obligor (or borrower) and the *loss rate given default* (*say* 50%), in any specific credit facility. In this example, the expected loss is $100 \times 0.02 \times 0.50 = 1. A typical risk rating methodology (RRM) initially assigns an OR that identifies the expected *probability of default* by that borrower (or group) in repaying its obligations in the normal course of business. The RRS identifies the *risk of loss* (principal or interest) by assigning a RR to each individual credit facility granted to an obligor.

RRs quantify the quality of individual facilities, credits and portfolios. If a RR is accurately and consistently applied then they provide a common understanding of risk levels and allow for active portfolio management. A RRS also provides the initial basis for capital charges used in various pricing models. It can also assist in establishing loan reserves. The RRS can be used to rate credit risks in most of the major corporate and commercial sectors, but it is unlikely to cover all business sectors. [8]

The use of internal rating systems raises lots of issues. For example, what is the meaning of being in RR category X? Does it mean that the obligors in this category have an expected default probability (EDP) within a pre-specified range? Or, is the rating associated with an expected LGD? What is the horizon over which these estimations are derived? For instance, for the rating system to be consistent with the credit migration approach to modeling credit risk, each

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[8] A typical RRS generally excludes banks, agriculture, public finance and other identified groups.

rating class should correspond to a range of default probabilities over a one-year period.

The internal ratings approach has practical implications for supervisors. Some key considerations will have to be addressed when assessing a bank's rating system: is the number of gradations appropriate to distinguish among the range of risks? How can the bank link the rating to a measurable credit loss? Are all the appropriate risk factors incorporated?

Notwithstanding these issues, the internal ratings approach is exciting because it would pave the way to the adoption of full credit risk modeling for the banking book in the future. The 1999 Basle consultative paper for a new capital adequacy framework (Basle Committee, 1999) provides insight into the regulator's view of the role that a RRS can play in attributing regulatory capital.

A typical RRS, as shown in Table 5, includes a category zero to capture government debt (say Canadian or US federal government debt). Category 1 is reserved for the highest credit quality of corporate debt. The average risk grades (e.g., **BBB/BB/B**) are often split (say into 4 and 5) to obtain greater resolution.

The OR represents the probability of default [9] by a borrower or group in repaying its obligation in the normal course of business. Facility ratings represent the expected loss of principal and/or interest on any business credit facility. It combines the likelihood of default by a borrower and the conditional severity of loss, should default occur, from the credit facilities available to that borrower.

The steps in the RRS (nine, in our prototype system) typically start with a financial assessment of the borrower (initial OR) which sets a floor on the OR. A series of further steps (four) arrive at a final OR. Each one of Steps 2 to 5 may result in a downgrade of the initial rating attributed at Step 1. These steps include analyzing the managerial capability of the borrower (Step 2), examining the borrower's absolute and relative position within the industry (Step 3), reviewing the quality of the financial information (Step 4), and the country risk (Step 5). The process ensures that all credits are objectively rated using a consistent process to arrive at accurate ratings. Additional steps (four, in our example) are associated with arriving at a final FR, which may be above or below the final OR. These steps include examining third-party support (Step 6), factoring in the maturity of the transaction (Step 7), reviewing how strongly the transaction is structured (Step 8), and assessing the amount of collateral (Step 9). The process, by steps, is described in detail in Sections 5–7 of this document.

First one needs to determine which entity (or group of entities) one is rating. For example, the analysis of a group credit involves calculating the OR for the

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[9] The probability of default in the economic model is calculated endogenously.

Table 5
Risk rating continuum (CIBC's RR system)

RR	Corresponding probable S&P or Moody's ratings	
0	Not applicable	Investment grade
1	AAA	
2	AA	
3	A	
4	BBB + /BBB	
5	BBB−	
6	BB + /BB	Below investment grade
7	BB−	
8	B + /B	
9	B−	
10	CCC + /CCC	
11	CC−	
12	In default	

entire group of entities, *provided* that all the important entities and borrowers are cross-guaranteed. If this is not the case, then one should rate any such borrower individually. If there are businesses or companies in different industries, or with different financial characteristics, then one often focuses on either the dominant entity (if there is one) or a balance of the important components, with specific recognition of any weak links.

A single entity might have a number of credit facilities with the bank that have different priority rules in case of bankruptcy. In this case, one must rate each facility with the credit. Conversely, if a number of facilities for a customer have similar characteristics (i.e., there are no distinguishing risk factors between the facilities) then one should apply the same FR to each facility.

3.2. Measuring default probabilities and recovery rates

"How accurate are ratings?" asks Moody's in its *Credit Ratings and Research* (1995, p. 5). The answer is provided in Fig. 4, which shows the average cumulative default rates for corporate bond issuers for each rating category over bond holding periods of one year up to 20 years after bond issuance. The data are for the period 1970–1994. It can be seen that the lower the rating the higher the cumulative default rates. The Aaa and Aa bonds experienced very low default rates, and after 10 years less than 1% of the issues had defaulted. Approximately 40% of the B-rated issues, however, had defaulted after 10 years.
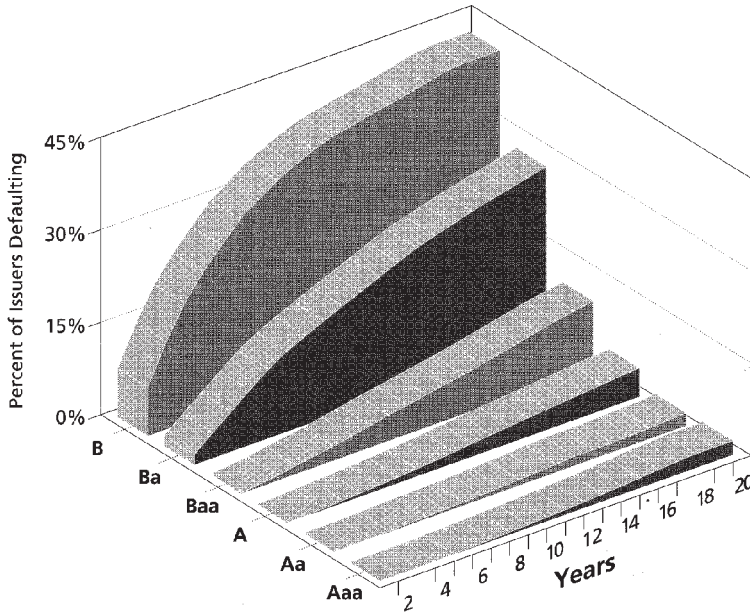
Fig. 4. Cumulative default rates for corporate bonds 1970–1994. (*Source*: Moody's Investor Service, 1995.)

Fig. 5 shows the average default rates within one year for different bond ratings during the period 1983–1993. In one year over 16% of the B3-rated bonds defaulted, while the rate is 3% for the Ba3 bonds, and almost 0 for the Aaa, Aa and A bonds.
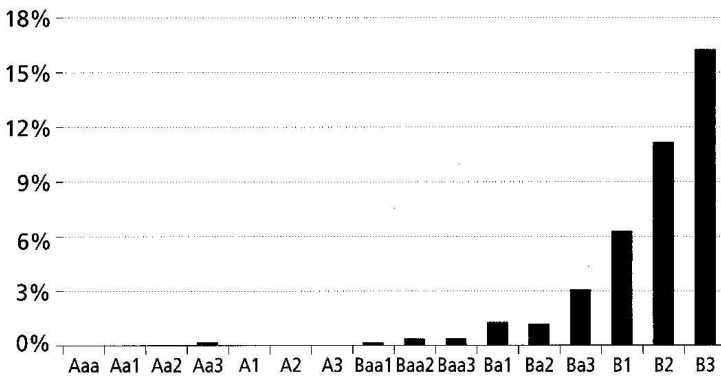

Fig. 5. One-year default rates by rating – 1983–1993. (*Source*: Moody's Credit Ratings and Research.)

Credit rating systems can also be compared to multivariate credit scoring systems to evaluate their ability to predict bankruptcies rates and also to provide estimates of the severity of losses. Altman and Saunders (1998) provide a detailed survey of credit risk measurement approaches. They compare four methodologies for credit scoring: (1) the linear probability models, (2) the logit model, (3) the probit model, (4) the discriminant analysis model.

The logit model assumes that the default probability is logistically distributed, and uses a few accounting variables to predict the default probability. Martin (1977), Watt (1985), Platt and Platt (1991) examine the logit model and find it useful in predicting bankruptcies. The linear probability model is based on a linear regression model, and makes use of a number of accounting variables to try to predict the probability of default. The multiple discriminant analysis (MDA), proposed and advocated by Altman (see, for example, Altman, 1997) is based on finding a linear function of both accounting and market-based variables that best discriminates between two groups: firms that actually defaulted, and firms that did not default.

The linear models are based on empirical procedures: they search out the variables that seem best at predicting bankruptcies. They are not founded on a theory of the firm or on any theoretical stochastic processes for leveraged firms. Another shortcoming is that most models are based on accounting data that is updated at discrete points and thus does not fully convey the dynamics of the firms and the continuous process leading to bankruptcy.

4. Debt rating and migration

Bankruptcy, whether defined as a legal or economic event, usually marks the end of a corporation in its current form. It is a discrete event, yet it is also the final point of a continuous process – the moment when it is recognized that a firm cannot meet its financial obligations. Analysts that focus solely on the event of bankruptcy disregard a lot of useful information about the status of the firm, its total value and the value of its liabilities.

Of course, credit agencies do not focus simply on default. At discrete points in time they revise their credit rating of corporate bonds. This *evolution* of credit quality is very important for an investor holding a portfolio of corporate bonds. In a study published in November 1993, Moody's summarized its experience of rating 4700 long-term public debt issuers in the period 1 May 1923 to 23 June 1993. For the period 1950 to 1979, 4.44% of the companies changed their ratings within a year, with the proportion of upgraded companies (2.26%) slightly above that of downgraded companies (2.18%). For the period 1980–93 the change of rating intensified to 10%, but the proportion of downgraded companies more than tripled to 6.82% of the rated companies.

Table 6
Long-term, modified rating changes by year 1983–1993

	Upgraded issuers		Downgraded issuers		Rating activity (%)	Drift (%)
	Number	Percentage	Number	Percentage		
1983	122	8.91	148	10.81	32.85	−4.60
1984	191	12.46	173	11.29	42.80	−3.98
1985	169	9.37	237	13.14	47.17	−18.48
1986	171	8.02	345	16.19	50.40	−24.98
1987	159	6.22	274	10.72	35.87	−10.79
1988	178	6.00	324	11.04	38.97	−11.82
1989	168	5.12	337	10.37	32.97	−16.51
1990	138	3.82	489	13.52	33.88	−21.21
1991	153	3.99	485	12.65	29.26	−16.38
1992	178	4.33	451	10.98	25.27	−11.54
1993[a]	238	5.40	450	10.21	23.88	−8.53

[a] The number for 1993 numbers are assimilated from the data available from 1/1/93 through 6/22/93.

Table 6 provides data on upgrades and downgrades since 1983 through 1993, the period that followed the introduction of the numerical modifiers to the letter rating in 1982. This period is characterized by deteriorating credit quality. The percentage of downgrades is substantially higher than the percentage of upgrades. The last column summarizes the drift of credit quality by counting the total number of numerical notches changed for upgrades minus the total number changed for downgrades, divided by the number of rated companies. The "Rating Activity" column and the "Drift" column take into consideration the size of the change in rating and not only the event of rating change. [10]

Actually, 57% of all rating changes were of one notch only, 30% of two notches, and 7% of 3 notches. These changes are for the numerical modifiers to the letter ratings. One letter change, for e.g., from Baa to Ba, occurred in 89% of the cases of letter change, and in 9% of the cases the change was two letters.

Using transition matrices, we can see how different rating categories have changed through time. Table 7 is based on Moody's experience from 1970 to 1993, and it contains the empirical results for the migration from one credit risk category to all other credit risk categories within 1, 2, 5 and 10 years. The values on the diagonals of the transition matrix show the percentage of bonds that remained in the same risk category at the end of the specified time period

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[10] If, for example, our universe contained 100 rated companies, of which 10 were upgraded during the year and 10 were downgraded, and if the upgraded companies moved on average by 1.5 notches (e.g., five were upgraded by one class and five companies by two risk classes) and if the downgraded firms were all downgraded by one single class, then the rating activity is $25\% = (10 \times 1.5 + 10 \times 1)/100$, and the drift is $5\% = (10 \times 1.5 - 10 \times 1)/100$.

Table 7
Transition matrices for bond ratings for 1, 2, 5 and 10 years[a]

From	To								
	Aaa (%)	Aa (%)	A (%)	Baa (%)	Ba (%)	B (%)	Caa (%)	Default (%)	WR (%)
Part A: One-year rating transition matrix									
Aaa	89.6	7.2	0.7	0.0	0.0	0.0	0.0	0.0	2.5
Aa	1.1	88.8	8.9	0.3	0.2	0.0	0.0	0.0	2.8
A	0.1	2.5	89.0	5.2	0.6	0.2	0.0	0.0	2.5
Baa	0.0	0.2	5.2	85.3	5.3	0.8	0.1	0.1	3.0
Ba	0.0	0.1	0.4	4.7	80.1	6.9	0.4	1.5	5.8
B	0.0	0.1	0.1	0.5	5.5	75.7	2.0	8.2	7.8
Caa	0.0	0.4	0.4	0.8	2.3	5.4	82.1	20.3	8.4
Part B: Two-year rating transition matrix									
Aaa	80.9	12.6	1.6	0.1	0.1	0.0	0.0	0.0	4.8
Aa	2.2	78.6	12.1	1.1	0.8	0.0	0.0	0.1	5.4
A	0.1	4.9	79.6	8.6	1.5	0.5	0.1	0.1	4.6
Baa	0.1	0.5	9.8	73.3	8.6	1.6	0.2	0.4	5.6
Ba	0.1	0.1	0.8	8.4	64.4	10.5	0.7	4.3	10.7
B	0.0	0.2	0.2	1.0	8.2	58.8	2.4	14.7	14.6
Caa	0.0	0.4	0.4	2.2	3.1	8.7	44.5	27.1	13.5
Part C: Five-year rating transition matrix									
Aaa	62.5	21.8	4.9	0.5	0.7	0.2	0.1	0.2	9.1
Aa	5.5	52.9	22.3	3.9	1.8	0.5	0.0	0.4	12.7
A	0.7	9.9	59.6	15.0	3.9	1.1	0.2	0.8	9.3
Baa	0.2	1.9	18.8	49.7	12.6	3.2	0.3	1.7	11.6
Ba	0.2	0.5	3.6	13.6	37.4	12.8	0.8	10.1	21.2
B	0.1	0.1	0.7	3.1	10.3	31.8	1.7	24.8	27.4
Caa	0.0	0.0	0.6	7.8	5.8	14.0	19.9	35.1	17.0
Part D: 10-year rating transition matrix									
Aaa	47.1	31.5	8.8	3.6	1.7	0.2	0.1	1.0	6.0
Aa	8.4	33.6	30.6	9.6	3.3	0.8	0.2	1.3	12.1
A	0.8	14.8	43.0	17.9	5.9	2.5	0.4	1.1	13.9
Baa	0.3	4.7	28.4	29.9	13.2	4.2	0.4	4.0	17.0
Ba	0.4	1.7	10.0	18.6	19.8	10.4	0.6	13.9	24.6
B	0.8	0.0	4.9	6.1	11.6	16.5	1.4	30.2	28.5
Caa	0.0	0.7	4.3	14.6	6.8	8.5	8.5	48.7	8.5

[a] *Source*: Carty and Fons (1993).

as they occupied at the beginning of the specified time period. For example, from Part A of the table, we see that 89.6% of the bonds rated Aaa, stayed in the same rating category a year later. Observe that 7.2% were downgraded to Aa, 0.7% downgraded to A, etc. A firm rated Baa stayed in the same risk category after 2 years in 73.3% of the cases (see Part B), while there was a 9.8% chance of the firm being upgraded to a rating of A. Bonds rated Baa had a 0.4% chance of defaulting within 2 years. The last column, "WR",

reports the percentage of issuers that had their ratings withdrawn at the end of the period.

It is interesting to note that bonds with an initial rating of Caa defaulted in 27.1% of the cases within 2 years, and that 35.1% of them defaulted after 5 years. For bonds rated Aaa the percentages were 0.0% and 0.2% for 2 and 5 years, respectively. After 5 years, only 62.5% of the Aaa-rated bonds had maintained their initial rating, about 28% of the Aaa bonds were downgraded, while over 9% had their ratings withdrawn.

Issuers rated Aaa can either maintain their rating or be downgraded. Caa-rated bonds can maintain their rating, be upgraded, or go into default. But what of Baa-rated bonds? Based on their history, they seem to have an equal chance of being upgraded or downgraded within a period of 1 and 2 years. However, over periods of 5 and 10 years they seem more likely to be upgraded than downgraded.

The transition matrices play a major role in the credit evaluation system of J.P. Morgan's CreditMetrics. This is because CreditMetrics uses the past as the basis for estimating probabilities for future migration among risk categories.

Moody's also supplies transition matrices for the modified rating categories, i.e., categories with number modifiers (e.g., A2) added to the letter ratings. The number modifiers, as pointed out in Section 2.2, enable Moody's to further differentiate the letter rating from say the highest quality A rated credit (i.e., A1) to the lowest A rated credit quality (i.e., A3) with a mid-range allowance for credit quality (i.e., A2). Additional statistics are given for issuers of short-term instruments. Moody's also suggests that a Weibull distribution most closely models the characteristics of bond ratings over their life spans. Figs. 6 and 7 provide, respectively, the estimated average length of letter rating lives and the average length of modified rating lives.
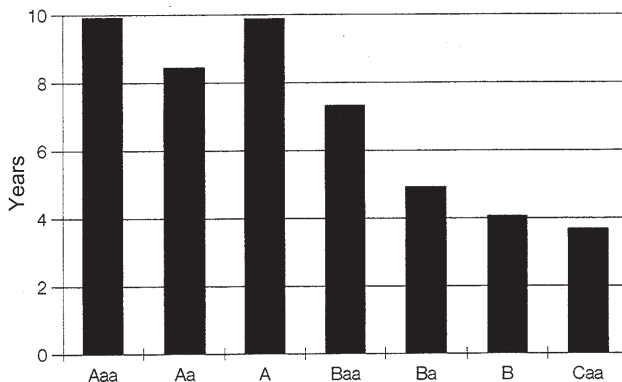

Fig. 6. Average length of letter rating lives. (*Source*: Moody's Investor Service, 1995.)
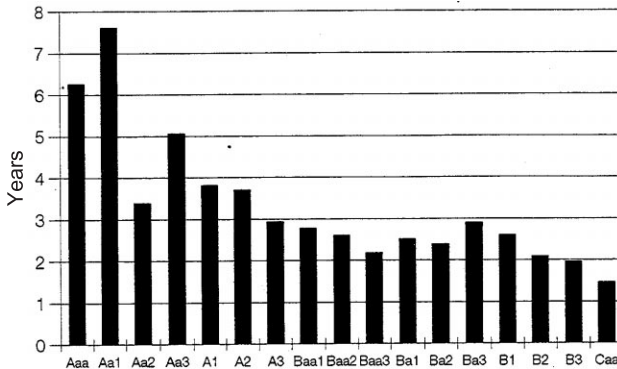
Fig. 7. Average length of modified rating lives. (*Source*: Moody's Investor Service, 1995.)

Based on past transition experience, researchers suggest various methodologies to estimate transition probabilities. Altman and Kao (1992a) use the Markovian stable and unstable models. Bennet (1987) analyzed the rating migration of bank's assets. In a recent article Altman (1998) compares expected rating changes for Moody's and S&P over the period 1970–96. The two agencies include in their statistics both newly issued bonds as well as seasoned bonds of all ages at a given date. They follow the migration for each pool of bonds for up to 15 years after the initial period. The major problem with this analysis is that while all the bonds in the pool initially had the same credit rating, they had different maturities. Older bonds have a greater tendency to migrate than newly issued bonds. Hence the pools may contain biases. Altman and Kao (1992b) investigate the migration of ratings from the initial bond rating until up to 10 years later.

Table 8 is reproduced from Altman (1998). It shows the one year transition matrix for long-term senior bonds based on statistics of Moody's, S&P, and Altman and Kao (A/K). [11] The time period covered by the different studies is not identical; this explains some of the differences, since migration is time-dependent, and is probably affected by macro-economic trends.

The aging problem affects the results, and consistently, the values on the diagonal for A/K are higher than for Moody's and S&P. In A/K the bonds in each initial category are newly issued and therefore have longer maturities. A/K also adjust for rating withdrawn (RW) since in many cases stopping to rate bonds is due to mergers and acquisitions of the issuer and hence to early redemption of the principal.

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[11] The article also shows the five and ten year transition matrices.

Table 8
Rating transition matrix – one year horizon[a,b]

	Aaa/ AAA	Aa/ AA	A/A	Baa/ BBB	Ba/ BB	B/B	Caa/ CCC	Def C/D	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 (A/K)	0.7	92.6	6.4	0.2	0.1	0.1	0.0	0.0	–
Aa (M)	1.2	86.8	5.8	0.7	0.2	0.0	0.0	0.0	5.4
AA (S&P)	0.6	88.5	7.6	0.6	0.1	0.1	0.0	0.0	2.4
A (A/K)	0.0	2.6	92.1	4.7	0.0	0.2	0.0	0.0	–
A (M)	0.7	2.3	86.1	4.7	0.6	0.1	0.0	0.0	6.0
A (S&P)	0.1	2.3	87.6	5.0	0.7	0.2	0.0	0.4	3.6
BBB (A/K)	0.0	0.0	5.5	90.0	2.8	1.0	0.1	0.3	–
Baa (M)	0.0	0.3	3.9	82.5	4.7	0.6	0.1	0.3	7.7
BBB (S&P)	0.0	0.3	5.5	82.5	4.7	1.0	0.1	0.2	5.7
BB (A/K)	0.0	0.0	0.0	6.8	86.1	6.3	0.9	0.0	–
Ba (M)	0.0	0.1	0.4	4.6	79.0	5.0	0.4	1.1	9.4
BB (S&P)	0.0	0.1	0.6	7.0	73.8	7.6	0.9	1.0	8.9
B (A/K)	0.0	0.0	0.2	1.6	1.7	93.7	1.7	1.1	–
B (M)	0.0	0.0	0.1	0.6	5.8	73.1	3.5	10.5	7.8
B (S&P)	0.0	0.1	0.2	0.4	6.0	72.8	3.4	4.9	12.2
CCC (A/K)	0.0	0.0	0.0	0.0	0.0	2.8	92.5	4.6	–
Caa (M)	0.0	0.0	0.0	0.3	1.3	5.3	71.9	12.4	8.8
CCC (S&P)	0.2	0.0	0.3	1.0	2.2	9.6	53.1	19.3	14.2

[a] *Source*: Altman (1998) (all numbers are percent).
[b] *Sources and Key*: A/K – Altman and Kao (1971–1989) from Altman and Kao (1992a,b) – newly issued bonds; M – Moody's (1920–1996) from Moody's (1997) – cohorts of bonds; S&P – Standard & Poor's (1981–1996) from Standard & Poor's (1997) – static pools of bonds; RW – rating withdrawn.

5. Financial assessment (Step 1)

5.1. Introduction

This step formalizes the thinking process associated with a good credit analyst (or good equity analyst) whose goal is to ascertain the financial health of an institution. For instance, the credit analyst would study the financial reports to determine if the earnings and cashflows are sufficient to cover the debt. The credit analyst will study the degree to which the trends associated with these "financials" are stable and positive. The credit analyst would also want to analyze the degree to which the assets are of high quality, and make sure that the obligor has substantial cash reserves (e.g., substantial working

capital [12]). The analyst would also want to examine the firm's leverage. Similarly, the credit analyst would also want to analyze the degree to which the firm had access to the capital markets, and whether it has an appropriate flexibility to borrow money.

The rating should reflect the financial position and performance of the company and its ability to withstand possibly unexpected financial setbacks. This is a key step in the credit assessment.

5.2. Procedure

The obligor will almost always be the borrower (or group of borrowers). Nevertheless, a guarantor, in certain circumstances (outlined below) may be substituted and regarded as the obligor. For example, one may substitute a guarantor for the borrower where the credit risk lies solely on the guarantor (i.e., the borrower's position is not a meaningful factor) and the guarantor is a large national (or international entity) warranting, say, an investment grade rating (i.e., a RR of four or better). Further, the debt needs to be structured so as to ensure that the bank will not be in an inferior position to other obligations of the guarantor, and the bank must make sure that a "clean 100%" guarantee is held. [13] One needs to monitor the guarantor's performance with the same care as if it were the direct borrower.

A prototype financial assessment table for RR 4 is shown in Table 9 below. The three main assessment areas, as illustrated at the top of Table 9 are: (1) Earnings (E) and cashflow (CF); (2) asset values (AV), liquidity (LIQ) and leverage (LEV); and (3) financial size (FS), flexibility (F) and debt capacity (DC).

A measure for earnings/cash flow in column 1 would include interest coverage such as EBIT/interest expense and EBITDA/interest expense. [14] A measure for leverage in column 2 would include the current ratio, which is defined as current assets divided by current liabilities. A measure for leverage in column 2 would include debt to net worth ratios such as total liability/equity.

One would calculate an RR for each of the three assessment areas and then arrive at an assessment of the best overall RR. [15] This is the initial OR. The

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[12] Working capital is defined as the difference between current assets and current liabilities.

[13] A clean 100% guarantee refers to a straightforward guarantee for 100% of the obligation without any condition as to the enforceability or collectibility, i.e., the bottom line is that the guarantor is "on the hook" just as firmly as the original obligor, and has no extra defense under law.

[14] For definitions of key accounting ratios see Appendix A.

[15] As an appropriate control, the average might first be compared to the worst of the three risk levels. The rating should not be more than 1.0 better than the worst rating. In other words, if it exceeds this control then it must be adjusted downwards. For example, if the three assessment areas were respectively, rated 2, 2, 5 then the average is 3, but the rating should be adjusted to 4 (being 1.0 better than the 5 risk level).

Table 9
Step 1 – financial assessment

RR	Earnings (E) Cashflow (CF)	Asset values (AV) Liquidity (LIQ) Leverage (LEV)	Financial size (FS) Flexibility (F) Debt capacity (DC)
4	*Very satisfactory* earnings and cashflow with substantial extra coverage	Assets of above average quality	General access (rated BBB+/BBB) to capital markets, may experience some barriers due to difficult market or economic conditions
	Positive and quite consistent/stable trends	Good liquidity/working capital	Ready access to alternate financing through banks or other financial institutions, if sought
		Better than average leverage	Bank debt modest with large unused capacity
		Appropriate matching of tenor of liabilities to assets	

remaining portions of a prototype financial assessment table for RR 4 is shown in Table 9.

There will be cases and/or industries where one of the three main assessment areas should be more heavily (or lightly) weighted when arriving at the overall financial assessment. The use of good judgment is essential. One should benchmark or relate this assessment to those of other companies in the same industry grouping.

One needs to emphasize the most current year's performance, with some recognition of the previous few years as appropriate when assessing the Earnings & Cashflow category. Cashflow is assessed using whatever methodology is most appropriate to the industry or individual situation (e.g., EBITDA). When assessing companies in cyclical industries one should adjust the financial results and key ratios so that the cyclical effect is incorporated. This is reasonable so long as downturns are within the scope of a normal cycle (i.e., not a remote fundamental correction). This means that strong performance during a very positive economic period should be modified downward somewhat (and vice versa during a weak period).

When assessing the financial size, flexibility and debt capacity category, the size of market capitalization will also be an important factor. The "Access to capital markets" phrase in this third assessment area refers to the demonstrated ability (or potential in the near-term) to issue public securities (equities or medium-to long-term debt (LTD) instruments), which generally will have

necessitated the assignment of a public rating. For private or smaller companies one should consider the ability to access these markets. If financial information/data is not available (such as for new ventures, projects etc.) then ''proforma'' data are often acceptable.

5.3. Industry benchmarks

The analysis of the competitive position and operating environment of a firm helps in assessing its general business risk profile. This leads to the calibration of the quantitative information drawn from the financial ratios for the firm, using industry benchmarks. The ratios summarize information on the profitability and interest coverage of the issuer, on its capital structure (i.e., leverage), asset protection, and cashflow adequacy. The major ratios considered include:

Box 1. Major ratios

1. EBIT interest coverage (x)
2. EBITDA interest coverage (x)
3. Funds from operations/total debt (%)
4. Free operating cashflow/total debt (%)
5. Pretax return on capital (%)
6. Operating income/sales (%)
7. LTD/capital (%)
8. Total debt/capitalization (%)

Appendix A provides a detailed definition of each of the key ratios.

Table 10 shows the interaction between the general business risk [16] assessment of a company and two selected financial ratios (ratios 3 and 8 from above) in determining the rating categories. A company with an excellent business can assume more debt than a company with average business possibilities. For example, a company with an excellent business position will be able to take on a debt to total capitalization ratio (ratio 8 above) of 50% in order to qualify for rating category A, whereas a company with only average business possibilities will only be able to take on a debt to total capitalization ratio of 30% in order to qualify for rating category A.

Table 11 provides data on average ratios for risk categories for three overlapping periods (1992–94, 1993–95, 1994–96). The table indicates that the ordinal nature of the categories corresponds well, on average, to the financial ratios. For example, if we examine the EBIT interest coverage ratio (i.e., EBIT

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[16] Business risk is defined as the risk associated with the level and stability of operating cashflows over time.

Table 10
Guidelines for adjustments in two financial ratios as a function of the business risk profile to qualify to a given rating category[a]

	Rating category				
Funds from operations/total debt guidelines (%)					
Company business profile	AAA	AA	A	BBB	BB
Excellent business position	80	60	40	25	10
Above average	150	80	50	30	15
Average	–	105	60	35	20
Below average	–	–	85	40	25
Vulnerable	–	–	–	65	45
Total debt/capitalization guidelines (%)					
Company business profile	AAA	AA	A	BBB	BB
Excellent business position	30	40	50	60	70
Above average	20	25	40	50	60
Average	–	15	30	40	55
Below average	–	–	25	35	45
Vulnerable	–	–	–	25	35

[a] *Source*: S&P Corporate Ratings Criteria, 1998.

divided by interest expense) then we would observe that the median for the AA credit class for the 1994 to 1996 period was 11.06 while for the BB it was 2.27. The ratio for the AA credit class ranged from a low of 11.06 to a high of 9.67 over the three (1992–94, 1993–95, 1994–96) three-year overlapping sample periods, while the ratio for the BB class ranged from 2.09 to 2.27.

5.4. Combining balance sheet, income statement and ratio analyses

The analysis of loans for the purpose of arriving at a RR requires one to think through certain classic relationships between balance sheet, income statement, and ratio analysis. We will first examine a few of these relationships for purely illustrative purposes and then show how they might be useful in arriving at a RR.

Total assets (TA), as shown in Box 2, are identically equal to total liabilities (TL) and net worth (NW):

1. $TA = TL + NW$.

Box 2. Balance sheet

Assets	Liabilities	Key relationships
CA	CL	$WC = CA - CL$
FA	LTD	$FW = FA - LTD$
	NW	$NW = WC + FW$
$TA = CA + FA$	$TA = TL + NW$	

Table 11
Key industrial financial ratios for rating categories[a]

	AAA	AA	A	BBB	BB	B
US industrial three-year (1994–1996) *medians*						
1. EBIT[b] interest coverage (x)	16.05	11.06	6.26	4.11	2.27	1.18
2. EBITDA[c] interest coverage (x)	20.3	14.94	8.51	6.03	3.63	2.27
3. Funds from operations/total debt (%)	116.4	72.3	47.5	34.7	18.4	10.9
4. Free operating cashflow/total debt (%)	76.8	30.5	18.8	8.4	2.4	1.2
5. Pretax return on capital (%)	31.5	23.6	19.5	15.1	11.9	9.1
6. Operating income/sales (%)	24.0	19.2	16.1	15.4	15.1	12.6
7. Long-term debt/capital (%)	13.4	21.9	32.7	43.4	53.9	65.9
8. Total debt/capitalization (%)	23.6	29.7	38.7	46.8	55.8	68.9
US industrial three-year (1993–1995) *medians*						
1. EBIT[b] interest coverage (x)	13.5	9.67	5.76	3.94	2.14	1.17
2. EBITDA[c] interest coverage (x)	17.08	12.8	8.18	6.0	3.49	2.16
3. Funds from operations/total debt (%)	98.2	69.1	45.5	33.3	17.7	12.8
4. Free operating cashflow/total debt (%)	60.0	26.8	20.9	7.2	1.4	(0.9)
5. Pretax return on capital (%)	29.3	21.4	19.1	13.9	12.0	9.0
6. Operating income/sales (%)	22.6	17.8	15.7	13.5	13.5	12.3
7. Long-term debt/capital (%)	13.3	21.1	31.6	42.7	55.6	65.5
8. Total debt/capitalization (%)	25.9	33.6	39.7	47.8	59.4	69.5
US industrial three-year (1992–1994) *medians*						
1. EBIT[b] interest coverage (x)	17.99	9.74	5.35	2.91	2.09	1.01
2. EBITDA[c] interest coverage (x)	22.63	12.82	8.0	4.82	3.5	1.9
3. Funds from operations/total debt (%)	97.5	68.5	43.8	29.9	17.1	9.9
4. Free operating cashflow/total debt (%)	51.0	29.7	20.2	6.2	3.4	1.1
5. Pretax return on capital (%)	28.2	20.6	16.7	12.7	11.6	8.3
6. Operating income/sales (%)	22.0	17.7	15.2	13.2	13.6	11.6
7. Long-term debt/capital (%)	13.2	19.7	33.2	44.8	54.7	65.9
8. Total debt/capitalization (%)	25.4	32.4	39.7	49.5	60.1	73.4

[a] *Source*: S&P Corporate Ratings Criteria, 1998.
[b] EBIT refers to earnings before interest and taxes.
[c] EBITDA refers to earnings before interest, taxes, depreciation, and amortization.

Current assets (CA) are identical to current liabilities (CL) and working capital (WC):

2. WC = CA − CL.

TA are also composed of CA and fixed assets (FA) which is

3. $TA = CA + FA$.

TL is composed of CL plus LTD, as follows:

4. $TL = CL + LTD$.

If we refer to $LTD + NW$ as *permanent capital,* then by rearranging our terms the "working capital" can be shown to equal the permanent capital minus the FA:

5. $WC = LTD$ [17] $+ NW - FA$. [18]

Fixed worth (FW) is defined as $FA - LTD$:

6. $FW = FA - LTD$.

NW can be expressed as WC plus FW:

7. $NW = WC + FW$.

A WC leverage ratio would express the riskiness of the current capital structure. One would also analyze certain key ratios. For example, a ratio of current liabilities to WC (called the WC leverage ratio) is analogous to the leverage ratio of TL to NW:

8. WC leverage ratio $= CL/WC$.

The leverage ratio expresses the riskiness of the overall capital structure, or how LTD is supported by equity:

9. Leverage ratio $= TL/NW$.

10. Current ratio $= CA/CL$.

A prototype high-level customer financial information (CFI) report is shown in Table 12 for General Motors Acceptance Corporation. Such a report is typically produced to facilitate credit analysis (at, say, the daily senior credit committee meeting of the bank). The CFI report is divided into a balance sheet, income statement and ratio analysis section. The ratio analysis section is further subdivided into leverage ratio and solvency ratio. An experienced credit analyst can quickly analyze such a report and get a "feel" for the financial assessment portion of the RR process. For example, one may analyze the leverage ratio (say, total liabilities/equity), solvency ratio (say, interest coverage) or other key financial analysis measures (see Appendix B) as part of arriving at the appropriate financial assessment.

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[17] A company can create working capital by borrowing on a long-term basis and employing the proceeds of the loan for CA. WC will increase by the amount of additional LTD less any addition to CL.

[18] WC is sometimes created by the sale of FA and it increases by the exact amount of the reduction of FA. As companies grow, however, it is more likely that the FA in the formula will represent a competing use of the various WC sources.

Table 12

Example Customer Financial Information report: Balance sheet, income statement and ratio data

	Factors	General Motors Acceptance Corporation (Million $)	
		12/31/1997	12/31/1996
Balance sheet	Current assets (CA)	44,658	41,598
	Current liabilities (CL)	64,288	50,469
	Working Capital (WC = CA − CL)	−19,630	−8871
	Fixed assets (FA)	64,661	56,980
	Mortgages/other (LTD)	36,275	39,841
	Fixed worth (FW = FA − LTD)	28,386	17,139
	Net worth (NW = WC + FW)	8,756	8,268
Income statement	Sales for year	16,595	15,974
	Operating profit (EBIT)	7,471	7,415
	Depreciation & amortization (DA)	4,735	4,668
	Bad debts	523	669
	Income taxes	913	837
	Net profit/loss	1,301	1,241
	Dividends/drawings	750	1,200
	Sundry adjustments	−63	−42
	Net capital expenses	0	0
	Interest expense (I)	5,256	4,938
Ratios	*Leverage ratios*		
	Total liabilities/equity	11.49[a]	10.92
	(Total liab − sub debt)/equity	44.49	10.92[b]
	WC	0.69[c]	0.82
	Solvency ratios		
	Interest coverage (EBIT/I)	1.42[d]	1.42
	Cash interest coverage (EBITDA/I)	2.32[e]	2.37

[a] TL = CL + LTD = 64,288 + 36,275 = 100,563, equity = NW, TL/equity = 100,563/8,756 = 11.49.
[b] No subordinated debt in 1996.
[c] Working capital current ratio = CA/CL = 44,658/64,288 = 0.69.
[d] EBIT = Operating profit. Note that EBIT/I = 7,471/5,256 = 1.42.
[e] EBITDA = EBIT + DA = 7,471 + 4,735 ≈ 12,206. Note that EBITDA/I = 12,206/5,256 = 2.32.

6. First group of adjustment factors for obligor credit rating

6.1. Management and other qualitative factors (Step 2)

This second step considers the impact on an OR of a variety of qualitative factors such as discovering unfavorable aspects of a borrower's management. We will assume for illustrative purposes that this Step 2 analysis has no effect on the RR if the obligor seems to reach an acceptable standard, but that it may bring about a downgrade if standards are not acceptable.

A typical Step 2 approach would require one to examine day-to-day account operations (AO), assess management (AM), as well as perform an environmental assessment (EA), and examine contingent liabilities (CL), etc.

If one is examining the day-to-day AO, then one would ask a series of carefully structured questions. For example, if the financial and security reporting is on a timely basis, is it of good quality? Does it satisfactorily explain significant variations from projections? One would also ask if the credit limits and terms are respected and examine whether any past requests for temporary excesses, terms, etc., were made before rather than after the fact. One would also ask if the company honors its obligations with creditors (legitimate disputes aside), as evidenced by a lack of writs, lawsuits, judgements, etc.

One would ask, in terms of performing a management assessment, if management skills are sufficient for the size and scope of the business. This would include examining if management has a satisfactory record of success as well as appropriate industry experience. One should also examine if management has adequate ''depth''; for example, are succession plans in place?

One would ask a series of practical questions. Is there an informed approach to identifying, accepting and managing risks? Does management stay current on how to conduct business operations, introducing and updating methods and technology when warranted? Does management address problems promptly, exhibiting the will to take hard decisions as necessary and with an appropriate balance of short- to long-term concerns? Is a reasonable business and financial plan in place, which does not depend on unrealistic levels of business growth or profitability improvement? Is management remuneration (cost to firm) prudent and appropriate to the size and financial strength/progress of the company?

One should ask from an EA point of view if management is aware of, monitors and complies with all relevant environmental regulations and practices. One should also examine any contingent liabilities, e.g., litigation, or warranty claims.

6.2. Industry ratings summary (Step 3A)

This portion of the third step recognizes the very important effect of an industry rating based on the *type of industry* and the *relative* position of the borrower (i.e., their tier assessment) within their industry. Experience has shown that poorer-tier performers in weak, vulnerable industries are major contributors to credit losses.

To do this, the analyst needs to rate each industry type on, say, a scale of 1 to 5. One should provide an industry assessment (IA) ratings scheme for each

industry broken down into selective sub-industry groupings. For example, the forest products industry may be broken down into a sub-industry grouping such as wood products. Similarly, the mining industry may be broken down into sub-industry groupings such as gold mines, base metal mines, etc. A rating is assigned to each of the industry groupings.

To calculate the IA, the analyst first assigns a score of, say, 1 (minimal risk) to 5 (very high risk) for each of a set of, say, eight criteria established by the bank (Table 13). For example, one can describe the industry rating in terms of competitiveness (see below for detailed definition), trade environment, regulatory framework, restructuring, technological change, financial performance, long-term trends affecting demand, and vulnerability to macroeconomic environment.

The sum of the scores, which will range from 8 (most favorable) to 40 (least favorable), can then be converted to an industry rating. For example, the asset would be rated 1 if it has a score ranging from 8 to 11. Similarly, a total score of between 12 and 19 yields an industry score of 2; between 20 and 27 a score of 3; between 28 and 35 a score of 4; and a score of 5 for a total score of between 36 to 40.

Competitiveness can be defined as the potential of the industry to sell its products in its domestic market and/or external markets, given its cost structure (determined by factors such as economies of scale, capital intensity, input costs, location, infrastructure and use of appropriate technology), international reputation, and effectiveness in targeting market niches.

Table 13
Rating the competitiveness of an industry

RISK				
Minimal 1	Low 2	Medium 3	High 4	Very high 5
Competitiveness The potential of the industry to sell in its domestic market and/or external markets based only on: cost structure (determined by factors such as economies of scale, capital intensity, input costs, location, infrastructure and use of appropriate technology); international reputation; and effectiveness in targeting market niches				
On balance, the combination of the relevant listed factors makes the industry very competitive	On balance, the combination of the relevant listed factors makes the industry somewhat competitive	The relevant listed factors have off-setting impacts on the competitiveness of the industry	On balance, the combination of the relevant listed factors makes the industry somewhat uncompetitive	On balance, the combination of the relevant listed factors makes the industry very uncompetitive

The trade environment can be defined as all the institutional factors that affect inter-jurisdictional commerce in goods and services, including trade agreements that have an impact (or potential impact) on the industry.

The regulatory framework can be defined as the legal/institutional setting including laws and regulations of applicable levels of government direct and indirect taxation; grant programs; trade finance; and subsidies. One needs to take into account present policies and trends, the industry's ability to absorb and influence these policies and trends, and the impact of both supply and demand.

Restructuring can be defined as the impact of the process of adjusting (often through a reduction in capacity or employees) to a change in market conditions, such as demand patterns, technology, number and quality of competitors, or regulations.

Technological change can be defined as industry vulnerability to technological change that could result in changing costs; an alteration in the range of products or services of the industry; or an alteration in the range/price of competitive products/services. Knowledge of previous technological change and current relevant global research and development efforts must be taken into account.

Financial performance can be defined as an assessment based on the present level, trends and sustainability of standard ratios such as return on equity, interest coverage, current ratio, debt/equity and debt/cashflow.

Long-term trends that affect demand include demographics (i.e., age structure, gender distribution, composition and wealth distribution of the relevant market); vintage of durables and infrastructure (age of fleet, age and condition of roads, bridges, etc.); and lifestyle changes and consumer attitudes.

Vulnerability to macroeconomic environment describes how sensitive the industry is to economic downturns, fiscal policy, movements in interest rates and exchange rates, and other macroeconomic variables.

Appendix C of this document offers an example of an assessment of the telecommunication (Appendix C.1) as well as the footwear and clothing industry (Appendix C.2).

6.3. Tier assessment (Step 3B)

The second part of Step 3 involves establishing tier assessment (TA) – the relative position of each business within its own industry. This is an important survival factor, particularly during downturns. One can use the criteria and process used to assess industry risk to determine a company's relative position in one of relative tiers – say, on a scale of 1–4 within an industry.

A business should be ranked against its relative competition. For example, if the company supplies a product/service that is subject to global competition then it should be ranked on a global basis. If the company's competitors are by nature local or regional, as are many retail businesses, then it should be ranked on that basis, while recognizing that competition may increase. If a business is local but has no local competitors, e.g., a local cable operator, then it should be ranked against such companies in other areas, with some recognition of the benefit of the exclusivity of its market (assuming that this is likely to continue).

Tier 1 players are major players with a dominant share of the relevant market (local, regional, domestic, international or niche). They have a diversified and growing customer base with low production costs that are based on sustainable factors (such as a diversified supplier base, economies of scale, location and resource availability, continuous upgrading of technology, etc.). Such companies respond quickly and effectively to changes in the regulatory framework, trading environment, technology, demand patterns and macroeconomic environment.

Tier 2 players are important or above-average industry players with a meaningful share of the relevant market (local, regional, domestic, international or niche). Tier 3 players are average (or modestly below average) industry players, with a moderate share of the relevant market (local, regional, domestic, international or niche). Tier 4 players are weak industry players and have a declining customer base. They have a high cost of production due to factors such as low leverage with suppliers, obsolete technologies, etc.

6.4. Industry/tier position (Step 3C)

This is the final part of the third step (step 3C). If one can combine assessments of the health of the industry (i.e., industry rating) and the position of

Table 14
Best possible obligor rating (given initial industry and tier ratings)

		Industry rating *(from Step 3A)*				
		1	2	3	4	5
Tier	Tier 1	No effect				
Assessment	Tier 2	On rating	Specific adjustments are provided with each row/column combination			
Within	Tier 3					
Industry	Tier 4					9
(from Step 3B)						

a business within its industry, then one can assess the vulnerability of any company (particularly during recessions). Low quartile competitors within an industry class almost always have higher risk (modified by the relative health of the industry).

One needs to combine the industry rating and the tier assessment using the grid in Table 14 to determine the "best possible" OR. The rating is best possible in the sense that it acts as a cap on the OR. While the rating can be lowered if the industry/tier assessment is weak, it will not be raised if it is strong.

For example, if the industry rating assessment indicates that the industry rating is 2, and is considered to be tier 3, then the best possible OR is 5. If Steps 1 and 2 had suggested a rating of 4, then Step 3 would require that this rating be lowered to 5.

6.5. Financial statement quality (Step 4)

This fourth step recognizes the importance of the quality of the financial information provided to the analyst. Again this step is not used to improve the rating, but to define the best possible OR.

The bank must always be fully satisfied as to the quality, adequacy and reliability of the financial statement information irrespective of the RR. This includes consideration of the size and capabilities of the accounting firm, compared to the size and complexities of the borrower and its financial statements.

Exceptions may be made. For example, they may be appropriate in the case of subsidiaries of large international/national corporations where the obligor's financial statements are eventually consolidated into audited financial statements of the parent. One may also make exceptions for new entities (or certain specialized industries) as well as obligors in countries where accepted practices differ from North American standards.

6.6. Country risk (Step 5)

This fifth step adjusts for the effect of any country risk. Country risk is the risk that a counterparty, or obligor, will not be able to pay its obligations because of cross-border restrictions on the convertibility or availability of a given currency. It is also an assessment of the political and economic risk of a country. The economics department of a bank is typically involved in analyzing the macro and micro economic factors that allow an analyst to calculate a country RR. (Naturally, if the counterparty has all or most of its cashflow and assets in the local market then one may skip this step.)

Table 15
Country risk[a]

Division country ratings	Adjustment to obligor rating
Excellent, very good, good or satisfactory	None
Fair	Best possible obligor rating is 5
Selectively acceptable	Best possible obligor rating is 6
Marginal/deteriorating	Best possible obligor rating is 7

[a] A condensed version of a prototype country analysis is provided in Appendix D.

A table should be developed to determine whether a country rating will affect the OR. Country risk exists when more than a prescribed percentage (say 25%) of the obligor's (gross) cashflow or assets are located outside of the local market. Country risk may be mitigated by hard dollar cashflow received/earned by the counterparty. Hard dollar cashflow refers to revenue in a major (readily exchangeable) international currency (primarily US dollars, UK pounds, Euro's and Japanese Yen, as well as Canadian dollars).

If the obligor is strong then short-term country risks (primarily trade finance and trading products) may warrant a better rating than the country. One may also mitigate country risk or improve the rating in a later step in the process. Obtaining political risk insurance (or other similar mitigants) may also (partially) mitigate country risk.

Again, Step 5 acts to limit the best possible rating. For example, if the client's operation has a country rating in the "fair" category, then the best possible OR is 5 (see Table 15). On the other hand, if the country is rated "selectively acceptable" then the best possible OR is 6.

7. Second group of adjustment factors for FR

7.1. Third party support (Step 6)

This sixth step adjusts a FR where important third-party support is held. (This step can therefore be skipped if the guarantor was substituted for the borrower at the outset.)

Considerable care and caution are necessary if ratings are to be improved because of the presence of a guarantor. In all cases, one must be convinced that the third party/owner is committed to ongoing support of the obligor. Typically, one establishes very specific rules for third-party support as described in Box 3. Based on the quality of the third-party support, the RR of the firm can be upgraded or downgraded.

Personal guarantors and other undertakings from individuals, and guarantees for less than 100% of the indebtedness, do not qualify for consideration in this category.

Box 3. Third party support

Type of support	
Guarantee	A 100% clean guarantee is held
Completion guarantee	A 100% clean guarantee is held until completion of the project
Keepwell agreement or operating agreement	A strong keepwell [19] or operating agreement is held and is considered legally enforceable
Comfort letter or ownership	A comfort letter [20] is held or not written assurance is held

7.2. Term (Step 7)

This seventh step recognizes the increased risk associated with longer-term facilities and the lower risk of very short-term facilities. A standard approach is to combine the adjusted FR (after any third-party support adjustment, in step 6) with the remaining term to maturity in order to determine the adjustment to the FR, as shown in the matrix in Table 16. One would also need to apply judgement of the primary use of the facility, particularly with respect to financial products.

7.3. Structure (Step 8)

This eighth step considers the effect of how strongly a facility is structured, its covenants, conditions, etc. in order to prompt appropriate adjustment(s) to the rating. The lending purposes and/or structure may influence (positively or negatively) the strength and quality of the credit. These may refer to the status of the borrower, the priority of the security, the covenants (or lack thereof) attached to a facility, etc. Take, for example, a facility that has been downgraded due to the term of a loan. If the structure contains very strong covenants which mitigate the effect of the term to maturity of the facility, it may be appropriate to make an adjustment to offset (often partially) the effect of the term to maturity of the facility.

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[19] A keepwell agreement is an agreement in which one party agrees to maintain a certain status or condition at another company, e.g., a parent company may agree to maintain the net worth of a subsidiary company at a certain level. This is a legally enforceable contract, however only the party to whom the keepwell is in favour of may sue under such a contract.

[20] A comfort letter is a letter generally requested by securities underwriters to give comfort on the financial information included in an SEC registration statement.

Table 16
Adjustment to facility rating

	Term to maturity of the facility		
0			
1			
2			
3	Specific adjustments are provided by each row/column combination		
4			
5			
6			
7			
8			
9			
10			

(Row labels on left margin: FACILITY RATING)

Box 4. Structure

Structure adjustment

Covenants/term: Covenants are in place which effectively mitigate all (or part) of any increased risk due to term, by means of default clauses that provide a full opportunity to make demands, or by means of repayment arrangements that ensure rapid pay-down

ACTION: Upgrade only to offset (possibly partially) any downgrade for term

Poor covenants: Appropriate covenants are not in place, or are very loose, so that review/default may/will not be triggered, even though significant deterioration occurs

ACTION: Downgrade

Subordinated/loans security: The bank's loan is subordinated, putting one's position and/or security significantly behind other creditors

ACTION: Downgrade

Corporate organization: The borrower is highly cashflow dependent on related operating companies that have their own financing

ACTION: Downgrade

Some instances that might affect ratings are listed in Box 4. Other considerations may affect the FR. For example, facilities that are readily saleable into the market may merit an upgrade due to their liquidity.

7.4. Collateral (Step 9)

This last and ninth step recognizes that the presence of security should heavily affect the severity of loss, given default, in any facility. The quality and depth of security varies widely and will determine the extent of the benefit in reducing any loss.

Security should be valued as it would be in a liquidation scenario. In other words, if the business fails, what proceeds would be available? If the total security package includes components from various collateral categories, then one should generally use the worst category containing security on which any significant reliance is placed. The collateral category should reflect only the security held for the facility that is being rated. (Exceptions are where all security is held for all facilities, and where they are being rated as one total.) Documentation risk (the proper completion of security) is always a concern and should be considered when assessing the level of protection. A few examples of collateral categories are shown in Box 5.

Box 5. Collateral

Collateral categories

Pledged assets are of very high caliber (generally no reliance on inventory) and provide substantial over-coverage (using conservative valuations, with liquidation appraisals held where warranted)

A first charge is held over specific company assets or all company assets (depending on the type of credit facility)

Background support may also add strength (personal guarantees do not qualify unless strongly supported)

Collateral can have a major effect on the final FR. One should also observe that the value of the collateral is often a function of movements in market rates. Accordingly, the final FR is dependent on movement of rates and therefore may be adversely impacted by a significant change in rates.

8. Conclusion

The utilization and appropriate processing of a variety of factors (e.g., key financial analysis measures) can provide the credit analyst with a tool to arrive

Appendix A. Definitions of key ratios

1. EBIT interest coverage (times interest earned) $=$ $\dfrac{\text{Earnings from continuing operations before interest and taxes (EBIT)}}{\text{Gross interest incurred before subtracting (1) capitalized interest and (2) interest income}}$

2. EBITDA interest coverage (cash interest coverage) $=$ $\dfrac{\text{Earnings from continuing operations before interest, taxes, depreciation and amortization (EBITDA)}}{\text{Gross interest incurred before subtracting (1) capitalized interest and (2) interest income}}$

3. Funds from operations/total debt $=$ $\dfrac{\text{Net income from continuing operations plus depreciation, amortization, deferred income taxes, and other non-cash items}}{\text{Long-term debt plus current maturities, commercial paper, and other short-term borrowings}}$

4. Free operating cash flow/total debt $=$ $\dfrac{\text{Funds from operations minus capital expenditures, minus (plus) the increase (decrease) in working capital (excluding changes in cash, marketable securities, and short-term debt)}}{\text{Long-term debt plus current maturities, commercial paper, and other short-term borrowings}}$

5. Pre-tax return on capital $=$ $\dfrac{\text{Pretax income from continuing operations + interest expense}}{\text{Sum of (1) average of beginning of year and end of year current maturities, long-term debt, non-current deferred taxes, and equity and (2) average short-term borrowings during year as disclosed in footnotes}}$

6. Operating income/sales $=$ $\dfrac{\text{Sales minus cost of goods manufactured (before depreciation and amortization), selling, general and administrative, and research and development costs}}{\text{Sales}}$

7. Long-term debt/capitalization $=$ $\dfrac{\text{Long-term debt}}{\text{Long-term debt + shareholders' equity (including preferred stock) plus minority interest}}$

8. Total debt/capitalization $=$ $\dfrac{\text{Long-term debt plus current maturities, commercial paper, and other short-term borrowings}}{\text{Long-term debt plus current maturities, commercial paper, and other short-term borrowings + shareholders' equity (including preferred stock) plus minority interest}}$

at the obligor and FR of a counterparty. The 1999 Basle Conceptual Paper has explicitly recognized that, in the future, an internal RR based system could prove useful to banks in their calculation of the minimum required regulatory capital. Basle has surveyed banks in terms of their methodology, mapping to losses, consistency, oversight and control as well as internal applications. We would expect that over time more sophisticated banks would all adopt a system based on internal ratings in lieu of a standardized external rating system.

Appendix B. Key financial analysis measures

B.1. Liquidity – ability to meet short-term obligations

1. Current ratio (CR) = current assets (CA)/current liabilities (CL).

2. Working capital leverage ratio (WCLR)
    = current liabilities (CL)/working capital (WC).

3. QR = quick ratio (acid test ratio)
    $$= \frac{\text{cash} + \text{marketable securities} + \text{accounts receivable}}{\text{CL}}.$$

    $$QR = \frac{\text{CA} - \text{Inventories}}{\text{CL}}.$$

B.2. Solvency – ability to meet key term obligations (ability to service debts)

1. Interest coverage $= \dfrac{\text{EBIT}}{\text{I}}$,

2. Coverage measures $= \dfrac{\text{EBITDA}}{\text{I}}$,

where EBIT is the earnings before interest, and taxes, I is interest expense and EBITDA is the earnings before interest, taxes, depreciation and amortization.

B.3. Leverage and capital measure

1. Debt to NW = TL/NW.

2. Senior debt to NW $= \dfrac{\text{TL} - \text{SD}}{\text{NW}}$.   *Note*: SD = subordinated debt.

3. Debt to tangible NW $= \dfrac{\text{TL}}{\text{total equity} - \text{intangible assets}}$.

4. Debt to assets $= \dfrac{\text{TL}}{\text{TA}}$.

5. LTD to assets $= \dfrac{\text{LTD}}{\text{TA}}$.

6. Total coverage ratio $= \dfrac{\text{CA}}{\text{TL}}$.

7. FA (a measure of illiquidity) $= \dfrac{\text{net fixed assets}}{\text{TA}}$.

B.4. Operating performance (profitability of a business)

1. Return on assets (ROA) $= \dfrac{\text{net income after tax}}{\text{book value of assets}}$.

2. Return as equity (ROE) $= \dfrac{\text{net income after tax}}{\text{total equity book valued}}$.

3. Gross product margins (GPM) $= \dfrac{\text{net sales} - \text{COGS}}{\text{net sales}}$.

4. Net profit margin $= \dfrac{\text{net income after tax}}{\text{net sales}}$.

5. Operating leverage (OL) $= \dfrac{\text{gross profit } (= \text{sales} - \text{COGS})}{\text{PBT } (= \text{FP} - \text{FC})}$.

6. Operating profit $= \dfrac{\text{operating profit}}{\text{net sales}}$
$= \dfrac{\text{earnings before interest and taxes}}{\text{net sales}}$.

7. Return on investment (ROI) $= \dfrac{\text{net income}}{\text{capital invested}}$.

8. Asset turnover ratio $= \dfrac{\text{annual sales revenue}}{\text{TA}}$.

9. Dividend yield $= \dfrac{\text{annual cash dividend}}{\text{price per share}}$.

  Note: $\text{ROE} = \text{ROA} \times$ asset to debt ratio.

B.5. Securities analysis

1. EPS $= \dfrac{\text{net income available for common stockholder}}{\text{total number of outstanding common stock shares}}$.

2. Earnings yield $=$ EPS/P.

3. Price to earnings ratio $=$ P/EPS.

  Market cap $=$ price of equity $\times$ total number of shares outstanding.

B.6. Ratios for evaluating the expenses of a business

1. Cost of sales $= \dfrac{\text{Cost of goods sold}}{\text{net sales}}$.

2. Overhead ratio (burden ratio) $= \dfrac{\text{sales, general, and administrative expenses}}{\text{net sales}}$.

3. Sales per employee $= \dfrac{\text{net sales}}{\text{average number of full time equivalent employees}}$.

4. Gross profit per employee $= \dfrac{\text{gross profit}}{\text{average number of full time equivalent employees}}$.

5. Direct employee expense $= \dfrac{\text{total salary and bonus expense}}{\text{average number of full time equivalent employees}}$.

B.7. Ratios for evaluating the sufficiency of a firm's cashflow

  Cashflow adequacy $= \dfrac{\text{cash from operating activities}}{\text{LTD paid + FA purchased + dividends paid}}$.

B.8. Ratios for evaluating collateral

  Collateral coverage $= \dfrac{\text{appraised or approximated value of collateral}}{\text{loan balance}}$.

If the borrower has more than one loan outstanding, and the loans are owed to the same bank, the balances on all such loans may be combined in the

denominator, and the total value of all of the collateral may be combined in the numerator. However, such combinations should never be made if the loans are not explicitly cross-collateralized.

Appendix C

C.1. Prototype IA: Telecommunications in Canada

Commentary on risk assessment criteria

Competitiveness: With its advanced and technologically up-to-date telecommunications infrastructure, the Canadian industry's competitive position is favourable vis-à-vis that of its trading partners. Moreover, changes in the regulatory framework over the past 3 years have resulted in downward pressure on rates spurred on by the innovative service offerings and pricing plans of the new entrants and the competitive response of the incumbents (especially in the long-distance area). While the erosion of the incumbents' long-distance market share has recently stabilized, the entry of new players in the local market, which was opened to competition on January 1, 1998, will result in renewed losses in market share in local telephony. The move from rate-of-return regulation to a price cap regime will improve the competitiveness of the industry, as the primary means of improving profitability will shift from growing assets to cutting costs and adding new revenue generating services.

Trade environment: Telecommunications services were not included in the NAFTA. However, as part of the WTO agreement liberalizing trade in telecommunications, Canada agreed to eliminate the monopoly in overseas telephone and fixed domestic satellite services. While Canada agreed to remove foreign ownership restrictions in very limited areas (global mobile satellites and submarine cable landings), the 46.7% ceiling for telecommunications and broadcast industries were maintained.

Regulatory framework: Effective January 1995, the industry's competitive businesses, principally long-distance voice, data, enhanced services such as ATM and frame relay, have been free of regulation. As of January 1998, the CRTC has opened the local telephone market to competition. By not forcing the incumbent telcos to offer cheap access rates to their local networks, the CRTC eliminates resale as a long-term strategy for the local market in the hope of attracting competitors who are willing to make long-term investments in their own facilities. The incumbent telcos, however, are expected to unbundle their services and provide new entrants with access to local network facilities which they cannot realistically duplicate themselves (e.g., local loops).

Restructuring: Driven by major regulatory, technological and competitive forces, the telecommunications industry has undergone significant restructuring over the past 3–4 years. Further restructuring is expected as a result of new entrants in the provision of local telephony.

Technological change: Technology is what drives this industry and has resulted in the introduction of a host of new enhanced high-margin services. As change is a constant in this industry, substantial capital investments are required and on-going R&D is imperative if the industry is to keep its competitive edge, and to upgrade its systems to provide the additional services that have been allowed by the CRTC. While the industry, as a whole is cash rich and can undertake these expenditures, keeping up with technological change represents a major challenge to smaller telephone systems.

Financial performance: Ratios are satisfactory and sustainable.

Long-term trends affecting demand: Corporate cost cutting has led to a greater reliance on electronic communications technology, boosting the demand for the industry's services. The increasing use of computers at home will keep demand for telecommunications services high even if some market share in the provision of these services is lost to alternate providers such as the cable companies.

Vulnerability to macroeconomics environments: The industry is mildly affected by the domestic cycle, as consumers may reduce the number of long distance calls and discontinue some value added services during a downturn.

Source: CIBC economics division.

C.2. Prototype IA: Footwear and clothing in Canada

Commentary on risk assessment criteria

Competitiveness: The apparel industry is dominated by a large number of small firms employing fewer than 50 persons, with very few of these operations benefiting from economies of scale. While some apparel companies are competitive in specific niche markets, such as men's suits and women's lingerie, labor costs in Canada relative to those in low-wage countries leave many apparel operations at a competitive disadvantage. Except in a few specialized areas, Canadian footwear companies are not competitive with the large US operations or the offshore low-cost manufacturers.

Trade environment: All tariffs on Canada–US apparel trade were eliminated on 1 January 1998. All apparel tariffs between Canada and Mexico under NAFTA will be eliminated by 1 January 2003. Under NAFTA, Canadian apparel manufacturers face stricter rules of origin, although in some product cases, duty refunds and tariff preference levels (TPLs) are available. TPLs

will be reviewed in 1999. Under the WTO trade rules, Canada has reduced its tariff rates on both footwear and clothing while quantitative restrictions on apparel imports will be eliminated by December 31, 2004. As a result, the Canadian apparel and footwear industries will be facing significantly more import competition in the future.

Regulatory framework: Currently, the apparel and footwear industries are not subject to any federal environmental legislation. Some labeling requirements are mandatory, especially if the product is to be exported to a NAFTA country. New simplified (symbols only) US care-labeling rules, when harmonized under the NAFTA, should reduce costs to manufactures who export within the region.

Restructuring: Increased competition from low-cost imports will necessitate further downsizing of the apparel industry. Apparel operations producing standard products that complete directly with low-cost imports will likely close. Further downsizing of leather footwear and skate manufacturing operations is anticipated.

Technological change: Highly flexible, fast, responsive manufacturing configurations and CAD/CAM design systems allow for more flexibility in terms of product design, layouts for cutting and shorts runs. They reduce input waste, as well as labor and inventory costs. Investment in such equipment is difficult to absorb by many of the smaller players in the industry, as is the procurement/hiring of the skilled labor needed to operate this machinery.

Financial performance: Overall, ratios are weak and are expected to weaken. Equity levels continue to decline as do profitability ratios.

Long-term trends affecting demand: With more casual days and flexible working arrangements in business, casual apparel and footwear continues to gain in popularity at the expense of more formal attire (a major portion of Canadian output). This trend is reinforced by the increasing importance of fitness and leisure activities in Canadian lifestyles.

Vulnerability to macroeconomics environments: Both the footwear and apparel industries are highly vulnerable to changes in the Canadian economy. An economic downturn and/or rise in interest rates affects consumer spending. These two industries are also vulnerable to exchange rate movements as many of their inputs are sourced from the US or offshore. Changes in exchange rates also affect the price of imports, of which most come from low-cost sources. Imports account for 75% of Canada's footwear market and 47% of Canada's apparel market.

Source: CIBC Economics Division.

Appendix D

D.1. Prototype country analysis report (condensed version): Brazil (country report: Brazil; Date: July 1999)

Table 17

Performance indicators[a]		Forecasts					
		1996	1997	1998	1999	2000	
Nominal GNP	US$bn	515	541	496	468	483	*Positives*: Privatization (utilities, ports, mining; telecoms). Largest market in Latin America. IMF-led rescue package from the international community
GNP per capita	US$	3262	3384	3058	2847	2894	
Real growth	(% ch)	2.8	3.2	0.2	(4.0)	(0.5)	
Investment/ GNP ratio	(%)	19.4	19.9	17.8	16.0	16.5	
Domestic credit growth	(%)	25.3	16.0	27.0	11.0	12.0	
Unemployment rate (urban centers)	(%)	5.4	5.7	7.1	11.0	10.8	
Inflation rate	(% ch)	15.8	6.9	6.1	10.0	20.0	
PSBR/GNP ratio (minus denotes surplus)	(%)	6.1	5.9	7.9	11.0	10.0	
Total exports	US$bn	60.6	67.3	65.1	68.2	71.3	*Negatives*: Economy is in recession. Large fast growing public sector domestic debt (48% of GDP). Still large current account and budget deficits. High reliance an foreign savings
Total exports/GNP ratio	(%)	11.8	12.4	13.1	14.6	14.8	
Merchendise exports	US$bn	47.8	53.0	51.1	53.9	57.0	
Trade balance	US$bn	(5.6)	(8.4)	(6.2)	0.4	(0.4)	
Current account balance	US$bn	(23.6)	(33.9)	(35.2)	(29.1)	(27.5)	
Balance of payments	US$bn	8.6	(7.6)	(8.2)	1.2	1.0	
Int'l reserves (gold @ 35 sdr/oz)	US$bn	58.6	51.0	42.8	44.0	45.0	
Exchange rate (average)	Real/US$	1.01	1.08	1.16	1.79	2.25	
Est. gross financing required	US$bn	91.9	112.4	96.2	100.0	91.8	*Needs to happen*: Reduce internal debt & PSBP.
Total external debt	US$bn	179.1	182.9	206.4	226.8	256.3	More structural reforms (i.e., privitization tax system, social security system).
Short term external debt	US$bn	63.8	55.7	38.9	37.1	35.3	
Current account/GNP ratio	(%)	4.6	6.3	7.1	6.2	5.7	

Table 17 (Continued)

Performance indicators[a]		Forecasts					
		1996	1997	1998	1999	2000	
External debt/GNP ratio	(%)	34.8	33.8	41.6	48.5	53.1	Rapid export growth so that the
External debt/exports ratio	(%)	295.7	272.0	316.9	332.6	359.2	large external debt can be serviced
Debt service ratio	(%)	45.8	66.6	69.7	90.9	82.9	

Comparative data 1998	Argentina	Chile	Mexico	Venezuela
Real growth %	3.9	3.1	4.6	1
Inflation %	0.7	5	15.6	36.5
PSBR/GNP % (minus sign denotes surplus)	1.8	(0.6)	7.5	3.3
Current account/GNP %	(4.8)	(6.4)	(3.5)	(2.2)
Debt service ratio %	49.1	24.4	39.9	29.1

Country risk rating profile

Basics: High real interest rates, fiscal austerity measures continue to limit the scope for business. Unsatisfactory repayment experience and poor data availability

Shockability: Pressured by excessive public sector spending and external factors, Brazil was forced to devalue (then float) the Real. Foreign savings and IMF are financing budget and current account deficits

Politics: Due to the devaluation, the president's popularity is low and his leadership ability has evaporated. The political will to carry out commitments to fiscal adjustment will be tested in the months ahead

Internal economics: Fiscal austerity (to control the public debt and reduce dependence on external savings) and high interest rates amid unfavorable conditions in world markets have led to a deep recession

External economics: Due to devaluation of the Real asset prices are now cheaper and this has attracted FDI inflows. After devaluation the current account is adjusting slowly. High financing requirements

Conclusion: The economy – and the political system – are far from healthy. President Cardoso's leadership ability has evaporated since the January 1999 Real devaluation. The political will to carry out important commitments to fiscal adjustment (needed to control the public debt and produce the economy's dependence on external savings) will be tested in the months ahead. While structural reforms have been approved, they are not being implemented swiftly. Conditions in the financial markets will soon be critical again. Other events or conditions could also trigger problems including rising unrest, as unemployment remains high, political corruption scandals, or domestic debt problems.

[a]

D.2. Prototype country analysis report (condensed version): Italy (country report: Italy; date: October 1998)

Table 18

Performance indicators[a]		Forecasts					
		1995	1996	1997	1998	1999	
Nominal GNP	US$bn	1087	1200	1123	1111	1174	*Positives*: Third largest market in W.Europe. Qualified for EMU in 1999. Dynamic SMEs. Efforts being made to cut red tape. Tax system being simplified
GNP per capita	US$	18,970	20,906	19,530	19,288	20,417	
Population	Mn	57.3	57.4	57.5	57.6	57.7	
Real growth	% ch	2.9	0.7	1.5	1.8	2.2	
Investment/GNP ratio	%	17.3	17.0	16.9	17.3	17.8	
Unemployment rate	%	12.1	12.2	12.4	12.3	12.1	
Inflation rate (year average)	% ch	5.4	3.9	1.8	2.0	2.1	
PSBR/GNP ratio	%	7.7	6.7	2.7	2.7	2.4	
Total exports (goods, services, net trans.)	US$bn	329.3	354.9	352.4	345.4	357.5	*Negatives*: Political instability. Very large public sector debt. Potential future pension problem. North-South divide
Total exports/ GNP ratio	%	30.3	29.6	31.4	31.1	30.5	
Merchandise exports	US$bn	234.0	250.1	238.2	235.9	248.5	
Trade balance	US$bn	44.8	60.9	46.9	39.1	32.2	
Current account balance	US$bn	25.1	41.0	33.5	18.1	13.7	
Balance of payments	US$bn	2.6	11.1	9.7	(2.2)	(1.0)	
Int'l reserves (gold @ 35 sdr/oz)	US$ \bn	38.3	49.4	59.1	56.9	55.9	
Exchange rate (year average)	Lira/$	1629	1543	1703	1788	1765	
Exchange rate (year average)	Lira/DM	1139	1026	982	988	990	
Est. gross financing reqired	US$bn	142.6	153.9	179.5	190.6	202.8	*Needs to happen*: Political co-operation. Constitutional reform. Reduce public debt. Tackle pensions issue properly. Meet challenge of EU competition. Further bank consolidation
Total external debt	US$bn	420.7	445.9	470.0	487.0	508.2	
Short term external debt	US$bn	140.7	153.4	162.4	168.5	174.1	
Current account/GNP ratio	%	2.3	3.4	3.0	1.6	1.2	
External debt/GNP ratio	%	38.7	37.2	41.9	43.8	43.9	
External debt/exports ratio	%	127.8	125.6	133.4	141.0	142.2	
Debt service ratio	%	26.9	24.0	23.2	23.1	22.1	

Table 18 (Continued)

Comparative data 1998	Portugal	Spain	Belgium	Germany
Real growth %	3.4	3.1	2.2	2.3
Inflation %	2.2	2.1	1.9	1.8
PSBR/GNP % (brackets denote surplus)	2.9	3.3	2.9	(2.7)
Current account/ GNP %	(2.0)	0.7	6.1	(0.1)
Debt service ratio	32.3	16.2	9.0	23.3

Country RR profile

Basics	Tax reforms and reduced bureaucracy have caused the business environment to improve. Retail sector deregulation, banking sector consolidation and privatization are underway. Disappointing data quality
Shockability	Higher reserve levels have caused merchandise import cover to improve. The prospect of EMU membership has supported market sentiment towards Italy during the recent global turmoil
Politics	Italy has qualified for EMU but prospects for further policy improvement are unclear. The new d'Alema government plans to pursue constitutional and economic reforms but its lifespan may be limited
Internal economics	GDP growth is expected to strengthen over the coming period but it will remain at moderate levels. As a result, unemployment is unlikely to fall significantly. Inflationary pressures will remain subdued
External economics	Net FDI flows are negative. The current account surplus has fallen. Increased competition from other EU companies will be a major challenge for Italian companies from 1999. Large balance of payment errors

Conclusion: Italy made great strides in strengthening its fiscal and inflation performance in 1997 and, in recognition of these gains, it was invited to become a founder member of EMU in 1999. However, while its involvement in EMU suggests a positive economic outlook, concerns remain over its ability to compete on a level European playing field. In addition, while new prime minister, Massimo d'Alema, intends to implement fully the three-year public debt reduction program unveiled by the former Prodi government, his ability to do so may be undermined by the need to maintain the support of each party in his seven-party coalition government. Italy's 61/RR3 rating recommendation explicitly reflects EMU membership and the implicit support from EMU partners in ensuring the availability of financial resources and sustained good economic policies

[a] *Source*: CIBC economics division: country and international analysis group.

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