THE SELECTION OF THE DISCOUNT RATE IN ESTIMATING LOSS GIVEN DEFAULT

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ABSTRACT

Loss Given Default (henceforth the LGD) is the ratio of losses to exposure at default. It includes the loss of principal, the carrying costs of non-performing loans and workout expenses. In light of the management and regulatory advances regarding LGD, this paper addresses the topic of choosing the proper rate to estimate the current value of recoveries. By means of a review of the available literature on LGD, the impacts of different solutions for the discount rate (contractual rate, risk-free rate and single-factor approaches) on the variability of LGD are analyzed and compared. In order to understand the influence of market constraints from both the static and dynamic standpoints, the paper studies the methodologies for the selection of the discount rate. Considering the limitations of the approaches found in both academic and operational literature, the paper proposes a multi-factor model to measure the discount rate based on systemic and specific factors. These factors, in light of the aggregate empirical evidence, can serve as explanations for the variability of LGD.

INTRODUCTION

When a debtor enters into the state of insolvency, the lender changes his primary approach from that of debtor to collector. The goal becomes to initiate the set of activities that will originate the maximum positive cash flows in the recovery process. The Loss Given Default (henceforth the LGD) is the amount of losses in the case of default and it represents an important management variable for any financial intermediary (Carey, 1998). It takes on importance for accounting, regulations and management purposes. LGD has an important role in determining the amortized cost of the credits in the balance sheet (Giordano and Lionetti, 2005).

In the New Agreement on Capital, the Basel Committee (henceforth, the Committee) provides that the minimum assets be determined through the following parameters: probability of default (henceforth, PD), loss given default (LGD), exposure at the time of default (henceforth, EAD) and the maturity (henceforth, M) (Basel Committee on Banking Supervision, 2005b). The LGD represents the component of proportional risk relative to the minimum capital requirement. For intermediaries adopting the advanced approach under the internal ratings method (henceforth, IRB method), the in-house estimate of LGD permits, *ceteris paribus*, a significant advance in the alignment of capital for regulatory purposes relative to economic capital (Schuermann, 2004).

LGD constitutes an important instrument for measuring the efficacy and the efficiency of the recovery process. The analysis of the relationship between contract characteristics and the level of the LGD turns out to be relevant for the definition of leading criteria in the selection of the technical forms and in the identification of suitable guarantees (Sironi, 2005). Assuming the estimate of LGD based on in-house data available, it is necessary to identify and to select a discount rate consistent with the changed risk faced by the creditor at the time of insolvency.

The recent developments in the international literature on LGD bring out its nature as a random variable and the influence of systematic variables on it. Empirical studies have demonstrated that the variability of LGD is related to not only the economic cycle but also the economic sector and the average recovery time. The removal of these assumptions constitutes a critical aspect for the selection of the discount rate,

which must be assumed in order to evaluate the yield of the investment during the recovery process (Basel Committee on Banking Supervision, 2005).

This paper starts by presenting a review of the literature on estimating the LGD. Specifically, we focus our attention on choices regarding the discounting of financial flows associated with the change in the statistical properties of the LGD and on the risk profile of the investment, before and after default (section 2). In order to understand the external influences on the selection of the discount rate on the in-house management of risk, the paper also analyzes the indications in the area of accounting and prudential standards both statically and dynamically, and discusses their implications for the purposes of determining the LGD according to an economic approach (section 2.1). The evaluator may choose among various acceptable rates on the basis of the constraints exerted by the laws in force and of the aims pursued with the analysis. With the purpose of delineating criteria for choosing among the possible alternatives, the characteristics and the limitations of the individual approaches are examined (section 2.2). In light of the approaches taken in the literature, this paper presents an alternative model for determining the discount rate, (section 3).

LITERATURE REVIEW

Analysis of the literature on recovery risk has been of increasing interest to academics, especially over the past few years. Of particular interest are the factors that influence LGD and the most correct methods for measuring it. The contributions proposed thus far do not identify an optimal solution for its analysis. This results in the need to select, case by case, the methodology most suited to the characteristics of the exposure in default (Basel Committee on Banking Supervision, 2005).

Study of the recovery processes carried out, even in countries having more evolved financial markets usually brings out a recovered value lower than the starting exposure, so that the role played in the determination of the overall risk of the financing operation by the LGD can not be deemed marginal (Covitz and Han, 2004). The factors influencing LGD can be classified into four macro categories (Grunert e Weber, 2005):

- debtor characteristics;
- aspects regarding the relationship;
- distinctive elements of the contract;
- macroeconomic factors.

The amount the recovery can be correlated with the debtor characteristics. The aspects most influencing them may be identified in the legal form, the dimension, the business carried on and the location of the company headquarters. In the case of a limited-liability or a joint-stock company, the intermediary can has recourse only against the company. As the level of indebtedness rises the probability that all loans will be paid in bankruptcy falls (Carey and Gordy, 2005). Companies of larger size, furthermore, can be *ex-post* riskier because the intermediary usually prefers not to immediately start up the recovery process and is more inclined to grant extensions or renegotiations of the debt (Carty and Lieberman, 1996). The business carried on (Acharya, Bharath, Srinivasan, 2003) may, furthermore, influence the company balance-sheet characteristics, determining a larger or smaller presence of tangible or intangible assets, a different level of indebtedness and a different degree of liquidability of the assets (Izvorski 1997) and involve, as a consequence, greater or lesser difficulty in starting the recovery procedure. The location of the company headquarters, finally, can influence the value of the recovery due to the nature of foreign laws (Davydenko e Franks, 2004); moreover empirical evidence shows that, within a country, application to a particular court can bring about a different duration and/or efficacy of the suit in question (Bank of Italy 2001).

LGD is negatively correlated with the degree of interrelationship between intermediary and customer and with the duration of the relationship. As economic importance increases and as duration of the relationship increases, the probability increases that the debtor does not honor the engagements taken on. This occurs because it will be hard to find other operators who will offer him credit under the same conditions (Berger and Undell, 1995). Making customers more faithful thus represents a factor mitigating LGD because as the information availability increases, the risk of mistaken customer evaluations drops (Longhofer and Santos, 1999).

The recovery rate is not independent of the characteristics of the relationship. A non-marginal role is played by the customer's assets situation, by the repayment procedures and by any guarantees on the relationship (Gupton, Gates and Carty). The capital structure of the debtor is significant because the eventual recovered value is negatively correlated with the amount (Van de Castle and Keisman, 1999) and the complexity (Hamilton and Carthy, 1999) of the debt already contracted by the counterparties. Contract clauses can limit the intermediary's exposure or the speed of the recovery process (Singh, 2003). The debt repayment procedures are the principal factor that can influence the EAD in any particular relationship. Operations calling for non-progressive repayments have a greater probability of resulting in low recovery rates. Finally, the efficacy and duration of the recovery process are influenced by the presence of any contractual guarantees (Altman and Kishore, 1996) and by the possibility of identifying and claiming the insolvent debtor's assets (Eberhart, Moore and Roenfeldt, 1990).

The value of the recoveries in any financial operation depends on the intermediary's capacity to obtain debt payments from the company or in case of business failure, to sell the company's assets to obtain the cash flows needed to meet the debt obligations (Palmieri, 2004). International market analyses suggests a negative correlation between the behavior of LGD and the business sector's economic cycle (Hu and Perraudin, 2002), meaning that the efficacy of a recovery process is not independent of the behavior of the economy in general (Truck, Harpainter and Rachev, 2005) and of the market in particular (Acharya, Bharath and Srinivasan, 2005). During an economic downturn, the recovery process is, in fact, less effective since, other conditions being equal, the cash flows available to the company reduce as the demand for goods or services falls (Frye, 2000) and the sell-off value of a company's assets decreases with the level of demand in the market in which it operates (Izvorsky, 1997).

The definition of the value of the LGD may be taken on by using different approaches, based on market data or in-house data, which can be classified in three macro categories (Schuermann, 2001): market LGD, implied market LGD and work-out LGD.

One of the most important differences is that the first two approaches assume an efficient market (Altman, 2006). Expectations of LGD are reflected in market prices, but other factors play a relevant role in the determination of ultimate losses (Carey and Gordy, 2005). International analyses have identified difficulties in estimating LGD with such approaches, especially for companies of smaller size that are not publicly traded (Araten, et al. 2004). The lack of market data necessitates use of the work-out approach for evaluating the intermediaries' credits portfolio. Moreover if the bank's policy is to work out the defaulted assets, as normally Italian banks do, LGD estimation needs to be based on discounted workout recoveries (Brady, Chang, Miu, Ozdemir and Schwartz, 2006) .

Regulatory Constraints Preceding the Basel 2 and IAS-IFRS Perspectives

LGD represents one of the components determining the variability of loss that the financial intermediary faces in the case of the counterpart's insolvency. In relation to the development of measurement methodologies, the new accounting and prudential standards require an explicit treatment for this variable notwithstanding the current primary (d.lgs 87/92) and secondary regulations on making up the individual

balance sheet (Bank of Italy, 1999). Among the aspects dealt with during the development of prudential and accounting standards, special attention is given to selection of the discount rate.

Prior to the implementation of the Basel 2 and IAS- IFRS frameworks, there was an implicit treatment of the LGD. From an individual accounting standpoint, before IAS-IFRS implementation, financial intermediaries must determine the presumable redemption value as the face value net the presumable loss at the bank due to the default (Cavalieri, 1995). Before Basel 2 the prudential regulation envisaged already standard risk weights to calculate the minimum capital requirements. This approached gave a more favorable treatment to the real estate exposure due to the positive impact of collateral on the recovery rate in the case of debtor's default (bank of Italy, 1988).

Those financial intermediaries, who intend to adopt the advanced approach envisaged by the method based on internal ratings (IRB), in order to use in-house estimates of the assets absorption, must comply with the minimum operating requisites envisaged by the New Agreement. Regarding these minimum operating requisites, the Committee deals with the topic of variability of LGD as it relates to the internal rating system and the quantification of LGD (Basel Committee on Banking Supervision, 2005).

With regard to the concept of the internal rating system, the Committee envisages that in rating a transaction, financial intermediaries must consider at least the following segmentation variables (De Laurentis, 2001):

a) the type of guaranty;
b) the type of operation;
c) the economic sector;
d) the purpose of the operation.

With regard to quantifying LGD, the Committee pays especial attention to its variability originating from the behavior of the economic cycle. Although utilized in the determination of capital requirements, LGD is not conditioned by determinations of the systemic risk factor (Gordy, 2003). In the rules for estimating the LGD the Committee introduces:

a) the forecast of the measure of the risk driver under conditions of economic downturn;
b) the imposition of a minimum value, equal to the long-term mean of the losses in case of insolvency, which mean is weighted for the defaults;
c) the upgrading of LGD of the exposures in default to incorporate the unexpected losses *ex ante*.

The Committee prudentially treats the event of economic downturn and its consequences on the LGD. The losses can exceed the average amount owed to the deterioration of the encashment values of the guarantes. Therefore, the Committee envisages that the financial intermediary, to take account of these possible scenarios, raise the value of the LGD over the average level.

The Committee's recommendations on the determinants of LGD and on the possible random nature of LGD have also been used to determine the discount rate (Basel Committee on Banking Supervision, 2005b). In particular, the Committee envisages that the financial flows, relative to the recoveries and to the costs sustained, must be discounted according to a rate consistent with an investment that possesses the following qualities:

- its amount equals the EAD;
- the time horizon is equal to the time interval that runs between the classification of the counterpart in default and the end of the recovery process;

- if relevant, the non-diversifiable risk must find a suitable coverage in the spread relative to the risk-free rate.

To adopt compliant solutions relative to the principle set forth and in harmony with other market constraints, according to the Committee financial intermediaries may resort to:

a) a discount rate suited to the recovery risk faced during the exposure period;
b) a conversion into certain equivalents of the flows from the recovered sums encashed and from the costs sustained;
c) an adjustment both of the discount rate and of the recovery flows and of the costs in harmony with the principle set forth.

It is believed that alternative sub a) best responds to the requisites envisaged by section 468 of the New Accord and, therefore, is suited to calculating a measurement of the LGD that reflects the economic loss faced by the financial intermediary. The Committee does not however indicate the model to be adopted for determining the discount rate. The absence of a prescriptive criterion depends on both the aim of aligning the capital for surveillance purposes to the economic capital and on the modest advance in the techniques of validation of the LGD (Pomante 2005).

As for alternative sub b), the Committee suggests use of the discount rate the risk-free rate only after having converted the incoming and outgoing financial flows into certain equivalents. This conversion is to be done through the application of conversion coefficients that take account of the influence of idiosyncratic and macroeconomic factors (Basel Committee on Banking Supervision, 2005c). From the interpretive standpoint, although this alternative is in line with the new accounting standards, the discount rate would not represent the yield of the financial intermediary's post-default exposure. Rather it represents the financial value to be compared with alternative investment opportunities.

The selection of the discount rate for determining the loss that the financial intermediary records when the counterpart's credit merit is impaired (impairment) is one of the central aspects of IAS 39 (International Accounting Standards Committee, 2003) for financial assets classified in the Loans and Receivables category. Setting aside the typology of the credit evaluation, whether analytic or collective, the financial intermediary must determine the loss as the difference between the amortized cost (Faraci, 2005) and the current value of the financial flows that he will encash during the recovery process. To determine the current value of the financial flows, the accounting standard envisages that the intermediary use the effective original rate (law 363/I of December 19, 2004, section 9 of the attachment).

Through the application of the original effective rate at the discovery of the impairment, the intermediary achieves the effective loss characterizing the credit exposure at the time of its evaluation. The evaluation methodology implies:

- coinciding the time horizon with the due date of the exposure and therefore neutrality relative to alternative forms of investment of the economic capital and
- the coinciding of the yield of the financial operation before and after default (Arnaboldi and Saita, 2005).

With regard to neutrality to alternative investments, once the financial intermediary has taken note of the counterpart's impairment, it can decide to terminate the relationship. In this case, the evaluation will also depend on the investment alternatives for the allocation of the capital. Therefore, the counterparty having a yield no longer available on the market could modify his choice.

The characteristics of the intermediary's investment undergo a change after the appearance of the counterpart's impairment. Furthermore, the risk of financial flows *ex-ante* impairment is different from the risk involved in the systemic and idiosyncratic factors that influence the risk of the financial flows *post* impairment. Should the financial intermediary decide to go ahead with restructuring the financing, presumably my modifying the contract in the creditor's favor, the discount rate to be applied would remain the original one.

The suitability of the effective original rate for determining the LGD according to an economic approach is relevant in light of:

1) the absence of consideration of the costs sustained by the financial intermediary in the recovery process. Such consideration is a fundamental element in order to use the accounting dimension of the loss;
2) the inclusion of the late interest among the post-impairment flows (ABI, 2002 and Dabbene, 2005), calculated using a different rate from that of the discounting of the expected financial flows;
3) the adjustment of the expected flows only when the loss has become manifest.

In light of the properties of the methodology of calculation of the loss after impairment has appeared, and, more generally, in light of the purposes of the new accounting framework (Lanotte, 2005 and Mariniello, 2004), the original effective rate is not deemed adequate for the determination of LGD in economic values. In particular, like any contract rate, it does not permit evaluating the effectiveness of the financial intermediary's recovery activities in respect to the market yield.

Choices of Discount Rate for the Estimates of the LGD Made According to the Work-out Approach

The use of the work-out approach offers the possibility of obtaining more accurate estimates for the evaluation of loans granted by Italian financial intermediaries. However it demands the availability of very detailed information sets and makes it necessary to select the proper rate for discounting future flows (Frye J., 2004). An examination of the literature reveals the presence of different useable discount rates. The rates proposed are:

- the contract rate applied to the customer;
- the risk-free rate;
- the correct yield rate, estimated using a single-factor approach.

In the course of this section, the three approaches are examined in detail. Their principal characteristics and their limitations are considered along with the importance of selecting the correct rate for discounting the flows tied to the recovery process. The contractual loan rate approach requires that the flows recovered by the intermediary, after the state of insolvency is discovered, be discounted at the contract rate defined at the start of the relationship or at the last contractual rate renegotiated with the customer. Adoption of this approach can be deemed reasonable only if it is believed that the opportunity cost of the missing recovery of the sums at contract due date be correctly identified by this rate. This approach assumes that the insolvency event does not modify the risk of the operation.

The contractual rate approach makes it necessary to gather a complete internal information set since any differences in the contracts stipulated have significant repercussions on the capacity to renegotiate the rates and, therefore, on their time development. The choice of using mean or aggregate rates does not represent a reasonable solution for estimating the LGD with this approach and a complex information

database has to be constructed. This information database is constructed from the internal data gathered by the intermediary (Asarnow and Edwards, 1995).

A simple analysis of the behavior of the rates negotiated by type of financing granted demonstrates that the choice to use aggregate rates for the Italian reality is problematic. (see Figure 1).   The trend underlying the behavior of the individual rates is similar, but significant differences are present in the interest rate levels during the individual period considered and in their behavior on time horizons shorter than one year.

The constraint of using only the specific rates in these approaches limits the evaluator to choosing the reference date for the rate used. The evaluator can select the initial contractual rate or last renegotiated contract rate. In the choice between the two solutions, a determining factor is the contract stipulation date. The higher the lag between contract signing date and the date of flows encashment, the less significant the use of the starting rate as the discount factor due to changes in economic conditions.

Figure 1: The Behavior of Contract Rates by Typology of Operation
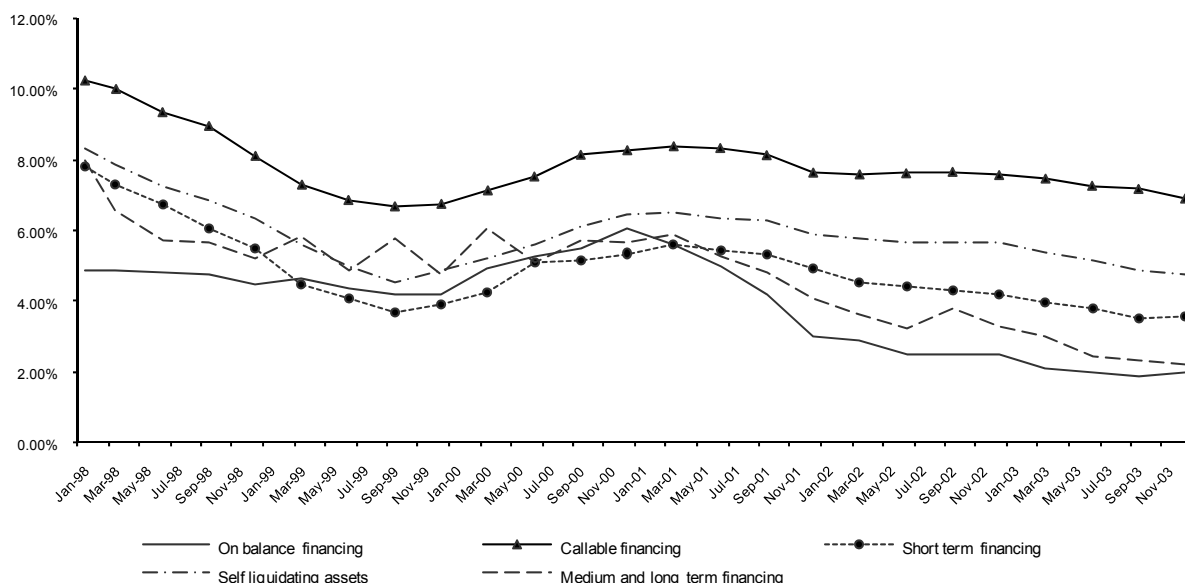
This figure plots the trend of interest rates for different types of lending. Data are collected from the Bank of Italy official database.

The significance of the result obtained using this approach will diminish, other things being equal, with the increase in the time lag between the contractual rate reference date and the dates of the recovery flows, as it will diminish with an increase in repayment frequency. A recovery process that envisages frequent flows makes it hard to apply the contractual rate methodology because the rate used for discounting is fixed over the entire life of the contract. The application of a constant rate does not represent a correct solution if the time horizon of the rate calculation does not coincide with the time horizon of the discount (Dallocchio and Salvi, 2004) and, especially for long recovery processes, the probability that the life of the contract will not coincide with the discount interval becomes high.

The current value of the flows tied to financing paid out can be estimated by considering the mean market rates for investment operations having lives similar to the operation considered. The difficulties in identifying this rate can push the intermediary to choose to use the minimum opportunity cost for the time deferment of the repayments: the risk-free rate. The applicability of this approach is, then subordinate

only to the identification of the reference market, and of the best proxy available for the risk-free activity yield (Unal, Madan and Guntay, 2003.).

Analysis of the risk free rates for the Italian market can be carried out under the assumption of the presence of insignificant default risk for sovereign states not classified as developing countries (Damodaran, 1999). The behavior of the securities issued by the Italian state having due dates lower than twelve months should be examined (see Figure 2).

The behavior of yield rates for the different types of Treasury bills considered brings out a substantial uniformity in the trend and in the levels of yield paid out, especially over the past few years of the period considered. The choice of the risk-free rate suited to the different due dates of the flows should not excessively influence the estimate of the LGD since the anomalies in the trend for the period of the rates for bonds for different due dates are only temporary and do not persist.

Figure 2: The Behavior of Risk-Free Rates for Different Due Dates
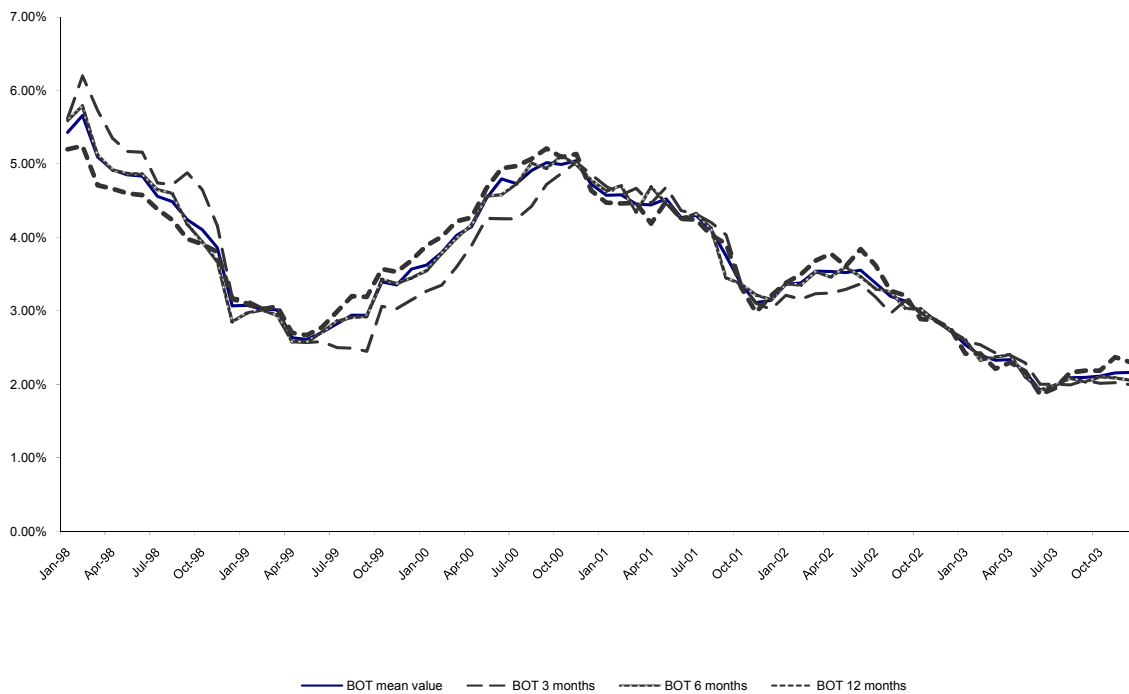
This figure plots the trend of risk free rates for different durations. Data collected from Datastream.

The default event suggests the possibility of foreseeing *ex ante* the amounts and the dates of the revocery cash flows. As such it brings about an increase in the risk of variability of the repayment flows tied to the financing paid out. Even under the assumption that the risk-free rate represents a correct value for discounting future flows coming in for the intermediary before the appearance of the default, it is hard to believe that the use of this rate is correct also when the flows lose their characteristic of certainty. The decision to estimate the LGD with the risk-free rate approach can result in underestimation because the current value of the flows generated by the recovery process would be computed without considering the greater degree of uncertainty that characterizes the recovery flows.

The use of a risk-free rate can lead to underestimating the loss in case of insolvency since it is likely that there is a non-zero risk of loss. A more credible solution envisages the use of a discount rate corrected for the estimated risk (Maclachlan, 2004) by using a model having a formulation similar to the classical CAPM (Sharpe, 1964) computed as follows:

$$E(r)_{CAPM} = r_f + \beta\left(E(r_m) - r_f\right)$$

(1)

where:

r_{CAPM} = estimated discount rate using the single-factor model
r_f = the risk-free interest rate
$E(r_m)$ = yield of a market index considered a proxy for the market portfolio
β = index that measures the degree of variability of the rate estimated as a function of the market variation.

This approach assumes the possibility of identifying an index representative of the market risk for all debtors considered in the estimate of the LGD (Duellmann and Trapp, 2004). The analyses carried out with these approaches usually use a proxy for the market index indicators relative to the average behavior of the defaulted bonds negotiated in the market (Altman, Brady, Resti and Sironi, 2002).

The estimate of the parameter β is made in finance with a historical series regression of the value of the financing activity relative to the market index historical series (Saita, 2006) and premises the availability of historical series that are adequately long and continuous (Damodaran, 1996). Analysis of the data available on recovery processes suggests a problem with this approach tied to the impossibility of borrowing. The approach is also limited by the unavailability of historical series adequately long. Therefore it is commonly necessary to estimate this parameter not on individual financings granted but on aggregations of financings having common characteristics. This estimation approach limits the accuracy of the estimate. The treatment of aggregates of similar operations makes it possible to increase the time horizon of observation by taking into consideration the yields of positions gone into default or closed on different dates. However, it is strongly influenced by the arbitrary criteria defined by the evaluator in the identification of the homogenous financing categories.

A HOLISTIC MODEL

The limitations associated with the alternatives proposed in the literature suggest the possibility of a new approach to measuring the discount rate that is more reasonable than the risk-free rate approach or the contractual loan rate approach. This new approach might define a value within these two extremes. Problems with the identification of relevant parameters for estimating the discount rate and the low significance of the market indices for distressed bonds (Damodaran, 1996), can make the single-factor approach unsuited. This limitation creates the premises for the development of more complex evaluation models that are less approximate. These new methods are based on a multi-factor model. On the basis of the literature presented and excluding all the aspects regarding the debtor, the contract typology and the presence of real or personal guarantees (Araten, Jacobs and Varshney, 2004), the following can be identified as relevant recovery-risk variables (Bank of Italy, 2001):

-   the risk-free rate;
-   the debtor's reference industrial sector;
-   the competent court for recovery processes;
-   the type of recovery action launched.

The model for estimating the discount rate in its minimum formulation should, simultaneously consider variables regarding both qualitative and quantitative aspects.

Having defined the functional form most suited for the estimate, the introduction of the two qualitative variables makes necessary an *ex-ante* study of the data available to identify a criterion for the conversion of qualitative data into measurements useable in estimating the discount rate. In the conversion of the qualitative data regarding the recovery process its efficacy must be taken into account, by attributing higher values to the recovery processes that determine more modest recovery rates. The extrapolation of a qualitative variable from the data on the competent court must instead consider the characteristics of the individual courts and of the procedures started up within these contexts. This is done by attributing higher values of the variable for the locations in which the recovery rates are usually worse.

The importance of the variables examined may be verified only by identifying significant differences in the value of the LGD related to these variables. Despite all this, it appears that the results obtained could vary significantly as a function of the portfolios of the customers studied. The analysis that follows was carried out through descriptive statistics on the relationship that exists between individual variables and the behavior of LGD.

Sector Characteristics and LGD

Losses in case of customer insolvency are tied to the general trend of the economy. It has been demonstrated that during upturn (downturn) phases of the economy the recovery process is, other conditions being equal, more (less) effective (Altman, Resti and Sironi, 2004). The impact of the economic cycle is not however independent of the debtor's sector of business and, for some business sectors, structural differences in the efficacy of the recovery processes are present (Frye, 2000). The importance of the customers sector for the recovery process characteristics was investigated. We examine how the dynamics of a proxy for LGD, estimated for the country Italy, differ depending on the sector considered. We also examine whether such differences can justify a correction in the rate used to compute the current value of the recovery flows.

In order to obtain an average estimate of the relevance of the factors identified for the Italian market, a standard approach was used following Sironi and Zazzara, 2003. A proxy for LGD was constructed through the statistical return flow of the Bank of Italy Risks Department (Bank of Italy, 1991). The characteristics of the data gathered by the Bank of Italy allow computation of LGD as a ratio between the number of passages to loss of the bad and doubtful debts (the LGD given the default event) and the population of credits that dropped into bad and doubtful debts during the preceding period (Bank of Italy, 2000). This relationship can be mathematically stated as:

$$LGD_t = \frac{PP_t}{SF_{t-1}} \times 100$$

(2)

Where:

LGD_t = estimated value of the LGD;
PP_t = number of passages into loss;
SF_t = amount of bad and doubtful debts.

On the basis of data available, the variable was computed using the statistical data for the period 1999-2004 provided by the Bank of Italy and calculating some synthesizing indicators on the indicator distribution (see Table 1).

The comparison between the average estimated value for the Italy aggregate and the value for the individual sectors demonstrates significant differences in the measurement of the LGD. These differences make it possible to hypothesize a relation between the debtor sector of business and the efficacy of the recovery process (Carthy, Hamilton, Keenan, Moss, Mulvaney, Marshella and Subhas, 1998). The balance sheet assets of subjects belonging to different sectors are not similar and, therefore, the size of the recovery flows may be significantly influenced by the type of business sector (Carthy, Hamilton, Keenan, Moss, Mulvaney, Marshella and Subhas, 1998).

Table 1: Descriptive Statistics of the LGD by Sectors of Economic Activity

	LGD									
	1999	2000	2001	2002	2003	2004	Mean	St. Dev.	Min	Max
Agriculture	1.89%	1.58%	0.48%	0.43%	0.12%	0.32%	0.80%	0.74%	0.12%	1.89%
Energy	2.56%	3.47%	0.39%	0.32%	0.14%	0.31%	1.20%	1.44%	0.14%	3.47%
Ferrous & non-ferrous metals	3.14%	3.56%	1.37%	0.80%	0.25%	0.25%	1.56%	1.45%	0.25%	3.56%
Non-metal minerals	3.08%	5.72%	0.63%	1.01%	0.29%	0.28%	1.84%	2.17%	0.29%	5.72%
Chemicals	2.47%	5.10%	3.38%	0.56%	0.02%	0.13%	1.94%	2.06%	0.02%	5.10%
Metals	3.00%	5.09%	0.98%	0.90%	0.17%	0.28%	1.74%	1.93%	0.17%	5.09%
Farm& industrial machinery	2.76%	5.17%	1.23%	1.17%	0.17%	0.64%	1.86%	1.84%	0.17%	5.17%
Office machines	2.77%	6.19%	0.98%	0.92%	0.16%	0.23%	1.88%	2.31%	0.16%	6.19%
Electrical material	3.84%	6.38%	1.31%	0.66%	0.13%	0.70%	2.17%	2.44%	0.13%	6.38%
Transport	4.97%	3.63%	1.03%	0.95%	0.28%	0.22%	1.85%	1.98%	0.28%	4.97%
Food	4.53%	4.15%	1.05%	0.54%	0.16%	0.77%	1.87%	1.94%	0.16%	4.53%
Textiles	4.03%	4.76%	0.54%	0.45%	0.19%	0.39%	1.73%	2.08%	0.19%	4.76%
Paper	2.62%	6.10%	0.43%	0.49%	0.31%	0.27%	1.70%	2.33%	0.31%	6.10%
Rubber and plastic	3.01%	4.38%	0.56%	0.83%	0.28%	0.50%	1.59%	1.69%	0.28%	4.38%
Other industrial products	4.43%	3.91%	0.52%	0.45%	0.18%	0.49%	1.66%	1.95%	0.18%	4.43%
Building construction	3.14%	2.48%	0.63%	0.42%	0.07%	0.16%	1.15%	1.32%	0.07%	3.14%
Trade	3.94%	3.30%	0.78%	0.86%	0.21%	0.35%	1.57%	1.62%	0.21%	3.94%
Hotels and public services	3.17%	2.31%	0.66%	0.68%	0.27%	0.18%	1.21%	1.23%	0.27%	3.17%
Transport and linked services	4.54%	3.11%	0.99%	0.78%	0.13%	0.78%	1.72%	1.72%	0.13%	4.54%
Communications	3.66%	2.68%	1.01%	0.60%	0.15%	0.43%	1.42%	1.42%	0.15%	3.66%
Italy	**3.52%**	**3.05%**	**1.25%**	**0.63%**	**0.76%**	**0.76%**	**1.66%**	**1.28%**	**0.63%**	**3.52%**

This table presents estimates of LGD for different sectors in the Italian market. Data collected from Bank of Italy official database.

Analysis of the variability involved during the years considered suggests a different degree of randomness in the recovery process depending on the business sector considered. The strong variability recorded for the LGD in certain sectors brings out, the need to evaluate the companies belonging to different sectors independently. It also suggests penalizing, by using of higher discount rates, companies belonging to the sectors where the variability is more accentuated. Further analysis might consider the impact of the industry-specific stress conditions on the variability of LGD (Brady, Chang, Miu, Ozdemir and Schwartz, 2006).

The Characteristics of the Competent Court and its Impact on the LGD

The competent court can influence the estimate of the economic value of LGD because the efficacy of judicial procedures is closely tied to the length of the recovery process and to the costs that the intermediary must sustain to enforce the claims (Carey and Gordy, 2005). Empirical analyses in the literature have the presence of a relationship between the geographic location of the court and the efficacy

of the recovery process in Italy. These findings support the need to make differentiated estimates depending on geographic area in order to obtain correct evaluations of LGD (De Laurentis and Riani, 2005).

The evaluation of the impact of the competent court's characteristics on the efficacy of the recovery process can be investigated by considering the data gathered by the Italian National Institute of Statistics (henceforth ISTAT) on the costs of administrative trials held in Italy over the past years (data are available only for the period 2000-2003) (see Table 2).

Table 2: Incidence of Recovery Costs by Geographic Area

Region	Recovery costs / Initial Exposure				Mean	St. Dev.	Min	Max
	2000	2001	2002	2003				
Piemonte	24.1%	24.3%	19.4%	24.8%	23.15%	2.52%	19.40%	24.80%
Valle d'Aosta	27.4%	17.0%	18.6%	22.8%	21.45%	4.66%	17.00%	27.40%
Lombardia	23.1%	22.5%	23.9%	20.4%	22.48%	1.50%	20.40%	23.90%
Trentino-Alto Adige	38.2%	22.8%	25.7%	24.8%	27.88%	6.99%	22.80%	38.20%
Bolzano	25.9%	23.1%	26.5%	24.5%	25.00%	1.52%	23.10%	26.50%
Trento	53.0%	22.1%	25.0%	25.7%	31.45%	14.45%	22.10%	53.00%
Veneto	19.4%	20.4%	19.3%	19.5%	19.65%	0.51%	19.30%	20.40%
Friuli-Venezia Giulia	23.2%	20.9%	26.4%	23.3%	23.45%	2.26%	20.90%	26.40%
Liguria	25.2%	19.9%	20.4%	32.3%	24.45%	5.75%	19.90%	32.30%
Emilia-Romagna	16.6%	18.2%	14.2%	18.9%	16.98%	2.09%	14.20%	18.90%
Toscana	28.7%	18.1%	26.0%	20.3%	23.28%	4.92%	18.10%	28.70%
Umbria	19.0%	20.3%	16.8%	18.6%	18.68%	1.45%	16.80%	20.30%
Marche	25.9%	20.1%	21.9%	22.4%	22.58%	2.43%	20.10%	25.90%
Lazio	17.5%	14.8%	20.2%	19.9%	18.10%	2.51%	14.80%	20.20%
Abruzzo	18.5%	22.6%	20.9%	22.6%	21.15%	1.94%	18.50%	22.60%
Molise	14.2%	17.9%	20.3%	19.8%	18.05%	2.77%	14.20%	20.30%
Campania	26.3%	22.4%	15.6%	17.2%	20.38%	4.90%	15.60%	26.30%
Puglia	22.3%	19.7%	25.5%	29.0%	24.13%	4.02%	19.70%	29.00%
Basilicata	22.0%	24.4%	14.8%	12.2%	18.35%	5.78%	12.20%	24.40%
Calabria	19.0%	27.8%	24.1%	25.0%	23.98%	3.67%	19.00%	27.80%
Sicilia	21.6%	15.9%	13.9%	17.9%	17.33%	3.28%	13.90%	21.60%
Sardegna	29.7%	30.7%	25.7%	25.1%	27.80%	2.81%	25.10%	30.70%
Italy	**21.9%**	**19.8%**	**20.8%**	**20.9%**	**0.86%**	**0.86%**	**19.80%**	**21.90%**

This table presents estimates of the relevance of recovery costs for different regions in Italy. Data collected from ISTAT.

Analysis of the ratio of costs to starting exposure for the different regions indicates significant differences in the difficulty of bringing suit for recovery by competent court. The study on average costs sustained indicates, that it is on average more economical to bring suit for recovery in some regions in the north of Italy. The results hold even if rankings of the regions on the basis of the incidence of costs are time dependent.

The study of the variability of the costs/exposure ratio indicates that for some regions (Trentino Alto Adige and Toscana) and for some provinces (Bolzano and Trento) variability is significantly higher than for the rest of Italy. The strong variability in the costs tied to the recovery process identified in some geographic areas represents a further risk factor for the intermediary. This cost variability further complicates estimating the discount rate for the LGD and should explicitly be consider.

The study of the impact of the court's characteristics on the recovery process must be completed by an analysis of the average duration of the suits and of the variability of their duration. In fact, a high variability in lawsuit duration identifies the riskiest scenario, in which the estimates made can be only slightly credible. In these instances recovery uncertainty is likely to be an increasing function of the time-to-recovery due to the exposure to unknown factors till the realized ultimate recovery (Miu and Ozdemir, 2005). Analysis of the ISTAT data on administrative trials held in Italy demonstrates the presence of significant differences among the individual regions, which could influence the efficacy of the recovery process (table 3).

Table 3: Duration of Recovery by Geographic Area

Region	Duration of the Recovery Process (n° of days)				Mean	St. Dev.	Min	Max
	2000	**2001**	**2002**	**2003**				
Piemonte	2,331	2,381	2,495	2,695	2,476	162	2,331	2,695
Valle d'Aosta	1,744	3,995	2,234	2,310	2,571	982	1,744	3,995
Lombardia	2,237	2,277	2,423	2,568	2,376	151	2,237	2,568
Trentino-Alto Adige	1,684	2,085	2,124	2,160	2,013	222	1,684	2,160
Bolzano	1,546	2,016	2,094	2,285	1,985	314	1,546	2,285
Trento	1,891	2,164	2,160	1,890	2,026	157	1,890	2,164
Veneto	2,692	2,881	3,007	3,060	2,910	164	2,692	3,060
Friuli-Venezia Giulia	2,209	2,551	2,471	2,452	2,421	148	2,209	2,551
Liguria	2,433	2,430	2,612	2,500	2,494	85	2,430	2,612
Emilia-Romagna	2,719	2,773	2,988	3,162	2,911	204	2,719	3,162
Toscana	2,505	2,726	2,784	2,901	2,729	166	2,505	2,901
Umbria	2,660	2,449	3,164	2,918	2,798	310	2,449	3,164
Marche	3,242	3,777	3,615	3,657	3,573	231	3,242	3,777
Lazio	1,968	1,987	2,098	2,211	2,066	112	1,968	2,211
Abruzzo	2,638	2,100	2,462	2,539	2,435	235	2,100	2,638
Molise	3,211	3,518	3,703	3,304	3,434	221	3,211	3,703
Campania	2,166	2,506	2,546	2,560	2,445	187	2,166	2,560
Puglia	3,045	3,458	3,458	3,327	3,322	195	3,045	3,458
Basilicata	2,878	1,676	3,167	3,399	2,780	766	1,676	3,399
Calabria	2,872	3,324	3,564	2,986	3,187	317	2,872	3,564
Sicilia	3,377	3,731	3,791	3,386	3,571	221	3,377	3,791
Sardegna	2,270	2,346	2,835	2,657	2,527	265	2,270	2,835
Italy	**2,431**	**2,577**	**2,724**	**2,785**	**2,629**	**158**	**2,431**	**2,785**

This table presents data about the duration of recovery processes for different regions in Italy. Data collected from ISTAT.

Analysis of the costs and duration of the trials identifies areas of excellence were LGD values are significantly lower than the average calculated for Italy (Cossin, Huang, Aunon-Nerin and Gonzalez, 2003). Also identifiable are geographic areas exhibiting a greater (lesser) variability of the recovery rates relative to the national average value and, therefore, a (greater) lower risk tied to the recovery processes.

The Importance of the Type of Recovery Action

The effectiveness of the recovery process is not independent of the type of recovery action because the mean duration of recovery processes differs significantly depending on the type of recovery process and the activities engaged in by the creditor (Table 4).

The choice adopted for type of recovery shows significant differences between in-court and out-of-court operations. The out-of-court agreement represents the solution that minimize the duration of the process but exposes to uncorrected estimates of duration. The in court approach are the solutions usually having a duration close to the average estimated value. The variability of the length of the recovery process due to the type of process determines the need to penalize (reward) in terms of greater (less) discount rate the operations that potentially are the most (least) exposed to the risk that the process extend beyond expectations.

Table 4: Duration of Recovery Process (n° of days) Classified per Type of Recovery Action

	Mean Duration of Recovery Process (n° days)							
	Liquidation				Assets Insufficiency			
	2000	2001	2002	2003	2000	2001	2002	2003
Piemonte	2,597	2,675	2,915	2,999	1,708	1,720	1,684	2,099
Valle d'Aosta	2,418	5,851	2,540	3,409	578	2,510	1,621	654
Lombardia	2,675	2,748	2,924	3,058	1,751	1,601	1,746	1,876
Trentino-Alto Adige	2,232	2,565	2,567	2,581	1,220	1,396	1,133	1,417
Bolzano	2,086	2,727	2,785	2,706	1,185	1,151	894	1,569
Trento	2,391	2,407	2,357	2,343	1,283	1,745	1,551	897
Veneto	3,021	3,249	3,370	3,375	2,153	2,223	2,325	2,509
Friuli-Venezia Giulia	2,635	2,841	2,785	2,978	1,327	1,500	1,954	1,323
Liguria	3,004	2,680	3,119	2,856	1,863	2,047	1,942	1,978
Emilia-Romagna	3,054	3,269	3,402	3,618	2,063	1,701	2,001	2,062
Toscana	2,978	3,141	3,274	3,286	1,710	2,007	1,922	2,138
Umbria	3,338	3,027	3,927	3,428	2,040	1,737	2,149	2,378
Marche	3,655	4,142	3,993	4,067	2,642	3,178	3,021	2,993
Lazio	3,107	2,952	3,162	3,157	1,566	1,622	1,675	1,761
Abruzzo	3,679	2,831	3,274	3,692	2,085	1,800	2,084	2,079
Molise	4,453	3,990	4,863	4,093	758	2,510	2,286	3,216
Campania	3,249	3,625	3,659	3,465	1,967	2,248	2,227	2,204
Puglia	3,862	4,258	4,111	3,974	2,617	2,888	2,991	2,961
Basilicata	4,108	3,070	4,206	4,052	3,051	1,335	2,285	2,926
Calabria	4,066	4,105	4,069	3,662	2,615	3,153	3,262	2,847
Sicilia	4,329	4,778	4,882	4,103	3,107	3,221	3,339	3,009
Sardegna	2,982	2,941	3,307	3,251	1,792	2,083	2,275	2,065
Italy	**3,025**	**3,146**	**3,336**	**3,347**	**1,954**	**2,035**	**2,166**	**2,240**
	Fully Refunding				Agreement			
	2000	2001	2002	2003	2000	2001	2002	2003
Piemonte	461	1,964	1,713	672	2,481	2,278	2,175	3,305
Valle d'Aosta	-	-	1,546	3,122	1,204	-	1,051	1,561
Lombardia	2,119	2,346	2,564	2,066	2,746	2,281	2,280	2,914
Trentino-Alto Adige	1,010	3,209	2,215	798	2,436	1,758	-	2,903
Bolzano	1,285	2,945	-	798	4,458	-	-	3,416
Trento	461	4,266	2,215	-	414	1,758	-	1,878
Veneto	1,732	2,565	2,945	2,788	2,885	2,972	3,152	3,225
Friuli-Venezia Giulia	574	1,188	1,434	1,647	2,455	3,230	675	1,455
Liguria	2,268	2,321	1,682	2,506	1,852	1,782	5,263	1,228
Emilia-Romagna	2,522	3,055	3,808	2,084	2,988	3,538	2,668	4,034
Toscana	2,520	2,235	2,513	2,092	1,979	2,601	2,639	3,466
Umbria	1,650	5,390	-	1,346	1,905	-	2,293	2,249
Marche	-	3,713	3,043	3,784	4,005	3,836	3,011	4,080
Lazio	2,117	2,904	2,901	2,394	2,355	2,527	1,861	2,189
Abruzzo	-	4,103	2,973	2,458	3,815	572	5,756	3,059
Molise	5,800	-	2,202	-	-	-	3,248	2,993
Campania	2,241	3,382	2,709	3,499	1,771	2,390	2,894	2,891
Puglia	3,893	3,574	4,501	3,351	2,861	3,704	3,216	4,438
Basilicata	-	1,915	-	1,440	885	1,554	2,832	4,528
Calabria	3,269	4,687	4,164	3,772	3,543	2,839	3,775	1,858
Sicilia	3,466	2,816	3,223	3,781	3,463	5,351	5,318	4,356
Sardegna	1,649	1,460	2,979	2,057	3,209	1,234	4,804	5,804
Italy	**2,299**	**2,881**	**2,899**	**2,670**	**2,576**	**2,865**	**2,875**	**3,016**

This table presents data about the duration of recovery processes for different regions in Italy. Data collected from ISTAT.

CONCLUSIONS

In this paper, we examine methods to select the proper discount rate to estimate LGD using a workout approach. The types of discount rate selected in the literature can be grouped into the following approaches: the contractual or original loan rate; the risk free rate; the single index model based rate. We contrast and compare the different methodologies.

We point out that the risk free rate understates the underlining recovery process risk, while the contractual loan rate, like the one proposed by the IAS/IFRS, is inadequate for long lasting recovery process or when the starting moment of the recovery process dates back in the past. We illustrate that the properties of the contractual loan rate are not coherent with the LGD measurement reflecting the volatility of the cash flows and the financial intermediary's efficiency during the recovery period. When the default occurs, the credit risk for the financial intermediary changes drastically as the payment source changes. That is when the focus of the debtor changes from servicing the debt to recovery. Among the risk adjusted approaches potentially coherent with the requirements under the New Basel Accord, we show that the mono-factorial approach is not adequate when other risks besides the economic cycle are present. We propose a multi-factorial approach as a more effective measure to explain LGD volatility and we show empirically the relevance of factors affecting the recovery action, like the debtor's economic sector, the competent court and the type of the recovery action.

NOTES

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